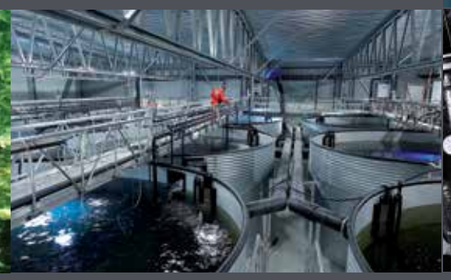
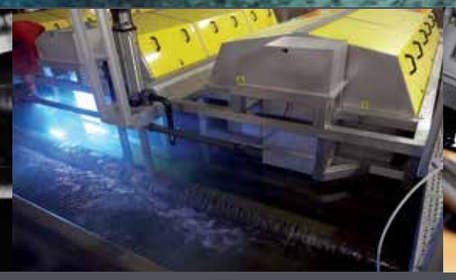
LAND BASED AQUACULTURE 2014/2015-E

Land Based Aquaculture 2014 2015





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AKVA GROUP™

Your Aquaculture Technology and Service Partner

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wavemaster™ polarcirkel™ fishtalk™ akvasmart™

Reliable and innovative aquaculture solutions combined with professional service and support

As a partner our mission is to improve your profitability and sustainability.

During more than 40 years as innovator and provider of technology and services to the global aquaculture industry, we in AKVA group have learned what really matters to our customers as well as to ourselves. Partnerships, good partnerships – enabling us to contribute solutions and services that make our customers successful in developing and operating sustainable and profitable aquaculture operations. Good Partnerships, where our contribution to solutions and services earn us the opportunity to develop AKVA group as a sustainable and profitable company.

We will continue to build AKVA group with this as our mission. We will be focused on our customers' needs, being attentive and responsive. We will develop and use our knowledge to contribute solutions and services that lifts our customers performance.

We will take pride in being reliable and honest in what we do and how we act, and we will use our enthusiasm to generate the energy and joy needed to bring our customers as well as AKVA group forward.

In AKVA we strongly believe that we can make a difference. We are proud to be part of the global aquaculture industry which is playing a crucial role providing healthy seafood world wide.

We are partners – and in it for the long run.

AKVA group is a solid partner with offices and facilities in Norway, Chile, Denmark, Scotland, Iceland, Canada, Australia and Turkey. With 8 offices and several agents and distributors around the globe AKVA group is present in all markets worldwide. AKVA group is a unique partner with the capability to offer both cage farming and land based aquaculture operations with complete technical solutions and service.

The company holds strong, well-known brand names and the product line range from plastic and steel cages, mooring systems, nets, net cleaners, work boats, feed barges, feed systems, camera systems, environmental sensors, underwater lights,production and process control software, recirculation systems, PE piping systems, farm design, on-site services and training courses.

Partnering with AKVA group allows customers to keep their focus on fine tuning farm operations to increase profitability, while sharing the technical challenges with a reliable partner with the right people, the right technology and the right knowledge to achieve excellence.

AKVA group is a leading technology and service partner to the aquaculture industry worldwide

CEO, AKVA group ASA.

Project planning

Two heads think better than one, says an old proverb. In terms of planning an aquaculture operation it translates into allowing people with different know-how to work together in the planning process. Letting AKVA's technical experts team up with your own operational experts will ensure a well founded and correctly dimensioned farming solutions.

Budgeting

Budgeting means planning years ahead to create an image of the size and shape of your operations.This is imperative to secure adequate financing and proper financial control. Allowing technical considerations into the budget will also help you identify constraints or bottle-necks in your operation.

Technical solutions

Are you happy with standard solutions or does your operation or managers require fine tuning of some of the hardware? In a carefully planned complete project, specific hardware requirements can be taken into account at an early stage so they won't add extra costs or delays along the way.

Installations

Plug and play may be the preferred mode for anyone wanting to connect two pieces of equipment together. In an aquacul-ture facility, putting the pieces together may not be quite as simple, although it might seem like it when our experts are at work. Professional commissioning and start-up will prevent future headaches and costly mistakes.

Service & support

Systems running year after year, some-times in extreme weather, will always be subject to extensive wear and tear. In order to maintain reliable operations, preventive service agreements and regular maintenance are critical. AKVA group's Service department has decades of experience in supporting and performing maintenance under such conditions.

Product training

Knowledge is always an important part of successful farm operations. Sufficient training of your staff and managers will minimize the amount of frustration that builds up while browsing through a manual in search of a solution to a problem. Hands-on training of staff, face-to-face is always the most effective method and a wise investment.

Worldwide Aquaculture

Reliable and efficient solutions

AKVA group had designed and supplied professional and commercially sound projects worldwide.
From complete cage farms for many fin fish species, to land based hatcheries with recirculation systems to break-through projects with new species.

AKVA group is the only supplier with the capability to offer both cage farming and land based aquaculture operations with complete technical solutions. Being a dedicated AKVA group partner means leaving responsibility for technical matters to external experts, while allowing your own personnel to focus on biology and production.

AKVA group's team of professionals knows what is important to succeed in the aquaculture industry. We are able and willing to take on the responsibility for delivering reliable technology with the quality, standards and service level needed to minimize the risk of technical problems which may lead to production down-time and associated financial losses.

We will ensure the integration and quality of our work by undertaking thorough and detailed planning and pre-project design of your farm.

From single components to complete aquaculture solutions with professional service and support.

Land Based Aquaculture

Feed System

RotorSpreders

Feeding Cameras

Underwater Lights

Environmental Sensors

Water Treatment Systems

Oxygen Cones

Sensor Network

Tank solutions

AKVA group tanks can be customized to any desired diameter and height thus making it possible to obtain perfect utilization of the available site space.

Water treatment

AKVA group has 30 years experience providing optimal water quality conditions for both fresh- and seawater operations.

Piping and pipework

AKVA group has one of the most modern production lines for polyethylene pipes in Europe and thousands of kilometres have been delivered since 1971.

Feeding systems

The Akvasmart CCS Feed System will feed the correct amount, at the optimal rate, on time, every time.

Sensor systems

Environmental sensor data are of vital importance. A better environment will always improve your production.

Underwater Lights

Light treatment is successfully used for smolt and juveniles in tanks and cages of different types and sizes.

Building your farm

The most optimal solutions

A few years ago it was hard to imagine a supplier of complete land based aquaculture solutions. Today AKVA group steps into that role, with all the commitment and dedication it takes to become the preferred supplier-, maintenance-, service- and training partner for such companies worldwide.

Your partner in advanced water treatment technology

AKVA group has more than 30 years of aquaculture engineering experience. Our team of world leading experts is renowned for designing sustainable recirculation systems that are second to none. Having delivered systems globally for more than 20 different species, AKVA group provides optimal water quality conditions for both fresh- and seawater operations.

One of the main advantages of the Recirculation Aquaculture System (RAS) maintains a perfect environment with superior water quality at minimum cost. All significant water parameters are monitored online and adjusted accordingly; ensuring optimal fish health and growth. This is the foundation for predictable aquaculture production and superior harvest quality for all species.

The first step towards your own Land Based Farm is to enter into a detailed pre-project agreement with us. Once this is completed, then you are all set to go ahead with a successful project!

From extensive to intensive aquaculture

AKVA group offers a wide range of land based aquaculture technology, from single components to complete water treatment installations worldwide. The dedicated range of quality products and software solutions provides maximum reliability and cost effectiveness.

Flow through system

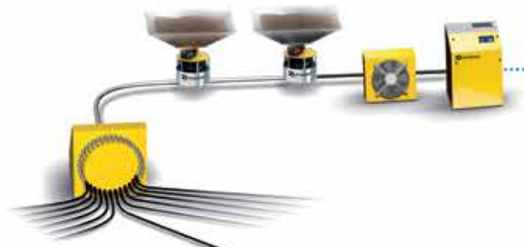
The traditional form of land based aquaculture with low level of water treatment technology. This form of aquaculture is commonly used on sites with vast amounts of water with a good temperature profile.

Re-use system

Re-use is often a result of a gradual increasing implementation of technology including for instance oxygenation and degassing. Depending on the level of technology, the Re-use relative to flow-through is often between 20 and 60%.

Recirculated system

Recirculation systems are currently being built all over the world and for many different species. A high level of technology allows a very high degree of water Re-use; normally in the range of 95-99% compared to the water consumption in a flow through system.



Feed Systems
Akvasmart CCS Feed Systems are integrated with the Recirculation Systems. Both centralized blower systems with Rotor Spreaders, and individual tank feeders, are connected to the Akvaconnect software. All systems are feed care optimized to preserve pellet integrity.

Software
A wide range of dedicated software solutions.

Mort Collector
Combined water outlet screen and mort collector system.

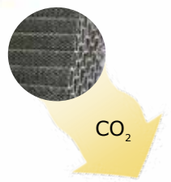
Oxygen Control
Stable oxygen levels are essential to all aquaculture systems, as periodical drops in oxygen levels reduce fish appetite, and increase stress levels and mortality.

Header Pumps
Water is lifted only once in the Recirculation System.

Split-Loop design
To obtain optimal stability of water parameters the flow pattern must be designed to correspond to the system loading. System performance is improved by the use of the Split-Loop design with lower flow rates through the Biofilter and higher flow rates over the Degasser, thus creating a perfect balance of biological nitrification and physical degassing processes.

AKVAconnect Software
AKVAconnect is the new "umbrella platform" controlling both equipment and software.

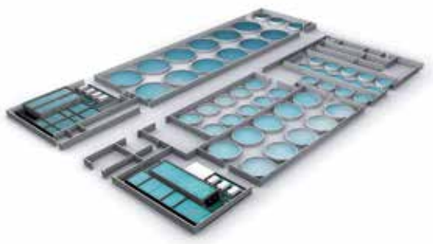
Biofilter
The fixed fluidised Biofilter combines high performance with simple maintenance and low operating costs. This multi-step concept has been developed for ultimate biofilter stability.



CO_2 Degasser
The CO_2 Degasser provides efficient CO_2 removal at low energy costs, including efficient stripping of nitrogen.

UV Filter
The UV Filter provides efficient ultra violet water disinfection at low costs. This design results in very low head loss.

Mechanical Filter
An efficient mechanical particle filter removing particles larger than 40 microns. This is crucial for optimal bio filter performance and general pathogen control.



Customized tank solutions - perfect utilization

Dedicated tank design

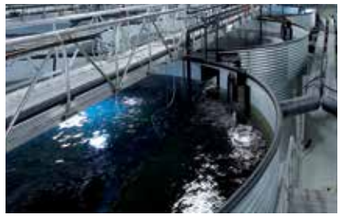
The production unit design is imperative for a successful rearing facility, and the solution depends highly on the behavioural pattern of the species. The tank system should be designed to optimize the water flow characteristics so that exact water exchange rates for the different species and fish sizes can be achieved.

Tailor made solutions

AKVA group tanks can be customized to any desired diameter and height thus making it possible to obtain perfect utilization of the available space on the site. For fast swimming species, such as Atlantic Salmon, a general recommendation is to have a diameter to depth ratio of approximately 3:1. Diameter to depth ratios in this area will provide good self-cleaning of the tank and at the same time make it possible to avoid powerful vortex in the centre of the tank that could otherwise trap the fish.

The two tank models from AKVA group are Polyethylene tanks (above) or Steel tanks with Polyethylene inner liner.

AKVA group tanks can easily be customized to any desired diameter and height



A popular steel tank solution with Polyethylene (PE) inner liner.

Low tank maintenance

All tanks from Plastsveis have High Density PolyEthylene (PE) inner liner which is a highly hydrophobic material making the tanks stay clean. Keeping the tank walls clean is a very important measure in preventing outbreak of disease. The potential hazards of a dirty tank wall are currently receiving increasing attention from scientists demonstrating that this may give pathogenic bacteria an opportunity to colonize and grow and subsequently infect the valuable fish.

A "snap- on" safety system prevents fish from jumping out of the tank and at the same time allowing full utilization of the entire production volume.

High quality walkways and platforms that provide a safe and stable work environment whilst allowing a better utilization of the available space.

The inner liner is also very smooth to prevent fish from getting wounded when in contact with the tank walls. The outer mucus layer and the scales on the fish is their primary immune system and preventing damage to this is one of the most important keys to securing a healthy and fast growing fish.

Larger tanks are reinforced with corrugated steel plates for additional safety and to ensure that the tank keeps it shape and that the hydraulic properties of the tanks remain optimal at all times.

Plastsveis tanks can be integrated with a wide range of tank equipment such as mort collector, degasser, oxygenation systems, feed system and water quality monitoring.

Decades of experience combined with cutting edge equipment for producing the tanks makes it possible to fabricate tanks in any size that can be shipped anywhere in the world at a low cost.

Our team of experts will always perform the mounting of the tanks on site to ensure that every delivery meets our high standards.

User-friendly Polyethylene tanks

Quality in every detail

Since 1999 Plastsveis has delivered more than 800 fish tanks to fish farmers in Norway, Canada, Scotland and the Faroe Islands producing cod, halibut, wolffish, arctic charr, trout and salmon. In addition to supplying new tanks they have installed liners in various types of existing fiberglass-, concrete- and steel tanks.

Standard fish tanks can be delivered in any size up to 20 meter diameter and 6 meter height. Larger tanks can also be delivered. We can customize diameter and height. There have been several deliveries where the customer wanted specific diameter and height in order to fit exactly to his buildings.

Using PE both in tanks and piping systems makes all connections easy. All connections are welded in order to get a 100% waterproof system.

Connections are easy to do when using PE both in pipes and tank walls/floors. Any connection can be welded resulting in a 100% waterproof environment.

PE tanks are easy to keep clean. There is no need to use high water pressure. Dirt and bio-film loosens very easily due to a surface that oxidizes.

AKVA group supplies different solutions for "water-out" and "water-in". The piping system can also be customized according to the customers preferences.

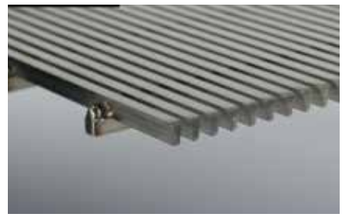
We have a wide range of welding machines in order to build a piping system for any size fishfarm. We also produce all bends, t-pipes and necessary pipe parts.

In close cooperation with our customers we plan, design and build landbased fishfarms from A to Z.

There are various concepts for mort collection. We are able to supply systems both inside and outside the tanks.

We offer complete piping and tank systems including piping for fish transport and mort collection. We supply specialized equipment for easy connections to the piping system.

Steel sheets are delivered on pallets. The liners are rolled up to minimum diameter. The total package is easy to transport in containers, resulting in low transport cost for deliveries world wide.



We supply different fish-trap systems. Slotted stainless steel screens are perfect for high water flow. The self-cleaning screeens have low maintenance and an extra long lifespan.

Tank solutions for various filters like, degasser, mechanical filter, UV filter and biofilter can be designed for each project.

Polarcirkel Polyethylene (PE) Pipes

Maintenance free, flexible solutions

AKVA group has one of the most modern production lines for polyethylene pipes in Europe and thousands of kilometres have been delivered since 1971. The pipes are straight pressure pipes made from PE raw materials especially suited for continuous use in harsh environments, and are based on decades of experience in pipe technology. Polarcirkel pipes are available in a wide range of models, shapes and sizes to suit individual needs and offer many benefits over competing systems.

Extruder- and butt-welding PE is a proven and strong method of joining piping components.

No corrosion or decay is caused by the electrolytic process and no risk of material deterioration as algae, bacteria or multicellular organisms are unable to attach themselves to the pipes. Polarcirkel pipe production is certified under Det Norske Veritas (DNV), ISO-EN 9001 /ISO 14001 Standard and NS-EN 12201.

All installations are carried out by certified welders which ensure accurate and quality assured installations of PE 100 pipes.

Maintenance free pipes

AKVA group produces PE pipes with state-of-the-art machinery, and offers complete pipe systems for high and low pressure applications. High quality raw materials are used throughout, and full documentation of the pipe production process can be provided by an in-line scanning system. This provides cost savings as well as ensures long, maintenance free lifespan of the pipes.

PE piping and plumbing parts are suitable for a wide range of industrial use, chemicals, corrosive fluids, sewage, sludge, water, food and agriculture granulates.

Industry and processing

The excellent corrosion and chemical resistance properties and long-term durability of PE pipe has resulted in the mining and process industries choosing polyethylene as their preferred pipework material.

Water and sewer

AKVA group offers a wide range of Polarcirkel PE pipes for underground water supply and sewage, all with outstanding performance advantages such as joint tightness, flexibility, abrasion resistance and extremely long durability.

AKVA group provides Polarcirkel solutions for water supply, outlet pipes, internal pipes, parts and fittings for hatcheries and land based aquaculture.

AKVA group offers a wide range of pipes and fittings from 20mm up to 1000mm diameter.

Sophisticated machinery produces pipes in a wide range of models, shapes and sizes to fit individual needs.

Feeding Pipes in various dimensions, wall thicknesses and coil lengths up to 1000 metres.

polarcirkel™

A complete pipe range

Reliable custom pipe production with state-of-art technology.

Polarcirkel PE-100 Pipe Dimensions

Outside diameter compared to thickness/weight per meter for SDR 17-7.4										
OD mm	SDR17 e (mm)	SDR17 kg/m	SDR13.6 e (mm)	SDR13.6 kg/m	SDR11 e (mm)	SDR11 kg/m	SDR9 e (mm)	SDR9 kg/m	SDR7.4 e (mm)	SDR7.4 kg/m
90	5.4	1.47	6.7	1.76	8.2	2.14	10.1	2.54	12.3	3.04
110	6.6	2.19	8.1	2.63	10.0	3.18	12.3	3.79	15.1	4.55
125	7.4	2.79	9.2	3.39	11.4	4.09	14.0	4.89	17.1	5.85
140	8.3	3.50	10.3	4.25	12.7	5.13	15.7	6.12	19.2	7.34
160	9.5	4.57	11.8	5.54	14.6	6.74	17.9	7.99	21.9	9.61
180	10.7	5.77	13.3	7.01	16.4	8.51	20.1	10.1	24.6	12.13
200	11.9	7.10	14.7	8.65	18.2	10.5	22.4	12.5	27.4	15.0
225	13.4	9.03	16.6	10.9	20.5	13.3	25.2	15.8	30.8	18.9
250	14.8	11.1	18.4	13.5	22.7	16.3	27.9	19.5	34.2	23.4
280	16.6	13.9	20.6	16.9	25.4	20.4	31.3	24.4	38.3	29.3
315	18.7	17.2	23.2	21.4	28.6	25.9	35.2	30.9	43.1	37.2
355	21.1	22.4	26.1	27.2	32.2	33.0	39.7	39.3	48.5	47.2
400	23.7	28.9	29.4	35.2	36.3	42.7	44.7	50.8	54.7	61.1
450	26.7	36.6	33.1	44.6	40.9	54.1	50.3	64.3	61.5	77.3
500	29.7	45.1	36.8	55.0	45.4	66.7	55.8	79.4		
560	33.2	56.6	41.2	69.0	50.8	83.7	62.2	99.6		
600	35.6	65.4	44.1	79.2	54.6	95.4	67.6*	115.7*		
630	37.4	71.8	46.3	87.3	57.2	105.0	71.0	127.6		
710	42.1	91.0	52.2	110.8	64.5	134.3	80.0*	162.0*		
800	47.4	115.0	58.8	140.7	72.7	170.4	90.1*	205.7*		
900	53.3	146.0	66.2	178.1	81.8*	215.6*				
1000	59.3	180.0	72.5*	216.9*	90.9*	266.2*				

OD = Outside diameter e = Minumum thickness Kg/m = weight per meter pipe * Contact us for more details

AKVA group can supply all you need for a complete PE-pipe installation

Custom welded or pressure injection moulded Polarcirkel PE pipe fittings, including: elbows, bends, tees, caps, stub ends, reducers, bushings, adapters, strainers, manifolds, flange systems, electro couplings etc. All in sizes from 20mm to 1000mm OD.

AKVA group's Polarcirkel pipe production is certified under Det Norske Veritas (DNV), ISO-EN 9001/ ISO 14001 standard and NS-EN 12201.

Mechanical Filters

Effective and reliable particle filtration

Mechanical filters for; inlet water filtration, effluent water filtration, filtration in recirculation systems and re-use systems

Filtering the inlet water to the farm will secure clean water by reducing the organic loading from outside and reducing the impact of invasive organisms. Also treatment of outlet water from farms before discharge is most often done efficiently by the use of mechanical filtration removing faeces from the farming process. In the recirculation farms, the main purpose of the mechanical filter is to remove the organic particles inside the system to secure a low and stable concentration of organic matter for keeping the biofilter performance optimal at all times.

Key points

• More capacity per m^2 filter area than seen before. Drain perfectly for minimal sludge water each m^3 filtered water. Durable and easy to replace.

• High efficient SEW gear motor with speed regulation and soft start directly on the gear, no shielded cable needed during installation.

• Heavy main construction of drum, frame and with duplex chain drive for strong and soft pull.

• Fully UV resistant PE main cover, PE motor cover and PE chain box to avoid any corrosive issues.

• Standard mounting option for installing spray pressure pump directly on the filter frame.

• Option for control that regulates the duty of the filter measuring actual differential pressure. Optimizes the water and power consumption dramatically.

New fully UV resistant Polyethylene cabinet

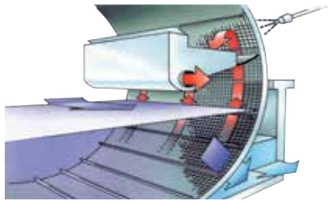
A screen size of 40 - 50 micron (µm) is normally the best choice for reducing the organic load with minimal head loss.

The drum filter removes particles such as feed waste and fish faeces.

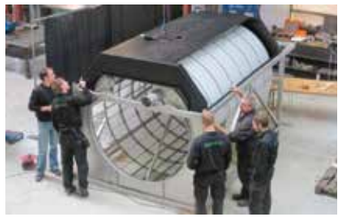
High efficient SEW gear motor with speed regulation and soft start directly on the gear.

The filter is also designed to withstand the environmental conditions: Filters for aggressive warm saltwater will be delivered in Duplex steel or AISI 316, and for colder freshwater conditions the use of less costly material, such as AISI 304 steel, can be used.

Effective filtration ensures a low and stable load of organic material, and is therefore crucial for the performance of the biofilter.



Through the automatic cleaning processes, only minimal maintenance is required.



The new Mechanical filters are now supported worldwide with staff specialised in aquaculture.

AKVAconnect provides the ability to gather data and combine information from all levels of the operations.

Ultraviolet (UV) Filters

Accurate bacteria balanced solutions

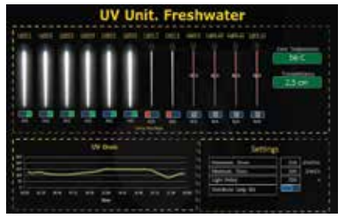
New built-in UV solution

Smart-Ray is a new concept that integrates our well known product standards and control system with flexibility and easy installation. We now offer an industrial size UV disinfection system for both water intake and internally within the fish farm environment.

The Smart-Ray system coupled with AKVAconnect, our new control system that secures an uncontested security in production. A smart control of the UV-Dose relates to the current quality of the water, adjusts, and insures a perfect balance between efficiency and energy consumption.

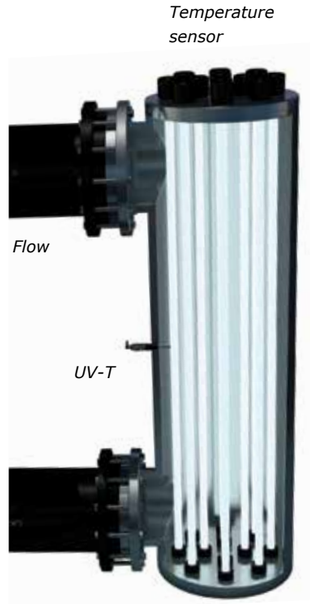
From low UV treatment to full water sterilization

This is done by applying ultraviolet light (UV) only to a carefully calculated portion of the water flow in each cycle. It is a common misconception that sterilizing all the water will control the bacterial dynamics in the rearing unit. However, as bacteria grow very rapidly on organic material, sterilizing the water would in fact have a destabilizing effect on the system. By only partially UV treating the water flow, the healthy and useful bacteria from the biofilter are allowed to dominate and suppress pathogenic bacteria. This prevents outbreaks of disease, and thus ensures maximum biosecurity.

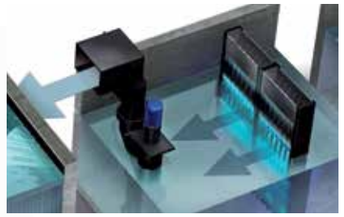


Detailed UV data is supplied from the new AKVAconnect software platform.

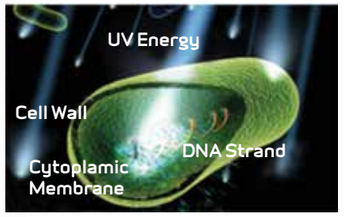
Our balanced probiotic UV concept ensures optimal conditions and fish welfare



New Smart-Ray built-in UV solution.

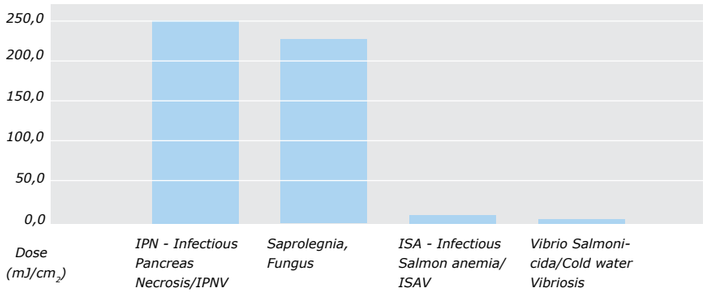


Effective filtration ensures a low and stable load of organic material, and is therefore crucial for the performance of the biofilter. (Open UV solution)

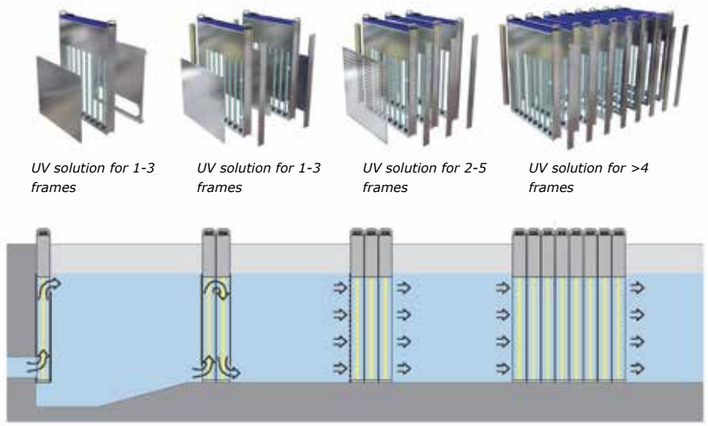


Our UV lamp emit rays at 254 nm. This destructs all vital cell processes and DNA/RNA synthesis.

Inactivation of pathogenic microorganisms - various doses of UV rays



Open channels, reservoirs



UV solution for 1-3 frames

UV solution for 1-3 frames

UV solution for 2-5 frames

UV solution for >4 frames

Header Pumps

AKVA group offers the best pumps available on the market.

Perfectly tuned water flow

Custom designed pumps ensure maximum operation

All components in the AKVA group Recirculation System have been carefully designed to ensure minimal head loss. Therefore, the water only needs to be lifted a minimal height by the header pumps for each cycle.

Reliable performance - almost maintenance free

The highly reliable pumps can also be delivered in saltwater resistant materials. These custom made propeller type pumps are extremely efficient for lifting large amounts of water with low head, and frequency control ensures optimal RPM and a long lifespan. Therefore, the recirculation system water flow is be perfectly tuned according to the biomass in the system.

Industrial quality pumps from AKVA group have high performance and extra low maintenance.

Multi-purpose end-suction pump
The ideal solution in oxygen cones and can also be applied in CO_2 degassing.

Multi stage centrifugal pump
A perfect wash down pump for drum filter cleansing. ***Flow propeller pump***
Designed for CO_2 degassing.

Pump Models	KPL Axial flow propeller pumps	NB Single stage end suction pumps	CR Multi stage centrifugal pumps
Benefits:	• Smart choice for CO_2 degassing • Turbulence Optimiser™ for best-in-class hydraulic efficiency of up to 85% • High-voltage motors for low installation costs • High-precision one piece propeller with back-swept design reduces clogging.	• Ideal in oxygen cones • Optimized hydraulics in housing and impeller for unimpeded liquid flow • O-ring seal between pump housing and cover means no risk of leakage • Housing, impeller and wear ring in different materials for improved corrosion resistance.	• Perfect washdown pump for drum filter cleansing • Available with Blueflux IE3 motor efficiency, reducing energy costs • Multi-flange fits a variety of standard connections for a flexible solution • Uniquely designed cartridge shaft seal increases reliability, reducing downtime.
Technical data:			
Motor size:	11 - 600 kW (up to 850 kW on request)	0,55 to 200 kW	0.37 - 75 kW
Flow rate:	9.200l/s (33.120 m^3/h)	Up to 1450 m^3/h	Maximum 180 m^3/h
Head (H):	10 m	150 m	Maximum 400 m
Liquid temperature:	0 to +40 °C	-25 to +140 °C	-40 °C to +180 °C
Discharge diameter:	Up to 2200 mm	DN32 - DN250	Up to DIN 150
Maximum installation depth:	20 m		
Maximum hydraulic efficiency:	87%	88,5%	80%
Maximum pressure:		16/25 bar - system pressure	24 bar - operating pressure
Variants:	• Propeller available in a variety of materials • Sensors for monitoring the pump, bearing and winding temperature, vibrations and water in oil.	• Available in a number of shaft seals and material variants. • Coating for seawater installation on request.	• Cast iron • Two grades of stainless steel • All-titanium
Applications:	• CO_2 degassing, biofilter	• Oxygen cones • Lifting pumps for CO_2 degassing	• Washdown pump for drum filter cleansing

CO_2 Degasser

Improved degassing allows higher pH

Accurate CO_2 stabilization

Control of carbon dioxide levels is essential for producing a healthy and fast growing fish both in flow through and in recirculated aqua-culture systems. Through extensive experience with degassing both for fresh- and saltwater species AKVA group has developed systems that are both efficient and durable. The use of composite and PE materials with hydrophobic properties ensures low maintenance and products that last even in saltwater.

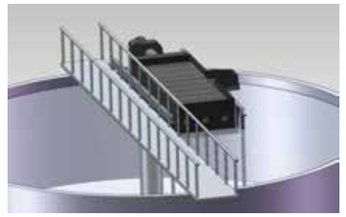
The degasser design provides a large water surface area for diffusion of gases from water to air.

Negative pressure inside the degasser pulls even more CO_2 out of the water. In addition, the built-in ventilation removes all the extracted gases and humidity from the building, significantly improving the degassing efficiency as well as the work environment for the employees.

The extremely high efficiency of the degasser reduces the total gas pressure in the water, making the oxygen diffuse more readily. This reduces both energy and oxygen consumption.

With the most effective degasser on the market, AKVA group is able to offer the best CO_2 levels at the lowest possible running costs.

Low and stable CO_2 levels is one of the most important success criteria in commercial aquaculture.



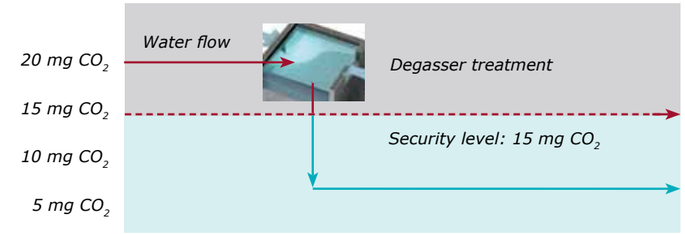
The degasser can also be an integrated part of each tank; either installed inside the tank or just outside.

Modularized polyethylene degassers with active ventilation can be offered in a wide range of sizes.

The degasser provides efficient CO_2 removal at low energy costs, including efficient degassing of nitrogen.

By installing a degasser, CO_2 levels decrease significantly and become more stable.

Low and stable CO_2 levels have documented effects on welfare, feed conversion ratios and growth.



The high efficiency of the degasser also allows for higher pH values which are optimal for fish welfare as well as the bacteria inhabiting the subsequent biofilter.

Effective removal of ammonia

The multi-step technology

AKVA group's multiple chamber biofilter design provides optimal conditions for the biological process of breaking down ammonia.
The key is to ensure that the organic material is consumed by heterotrophic bacteria early on in the biofilter.

The heterotrophic bacteria multiply more rapidly than the nitrifying bacteria and will therefore dominate the filter if given the chance.
The absence of organic material in the subsequent chambers ensures ultra thin biofilm on the filter media, thus provides optimal conditions for nitrification.

The new biofilter concept can easily be customized for different locations.

The fixed fluidized biofilter technology combines the low operating costs of a fixed filter with the high surface-to-volume ratio of a fluidized filter. This ensures effective removal of ammonia at minimum operating costs.

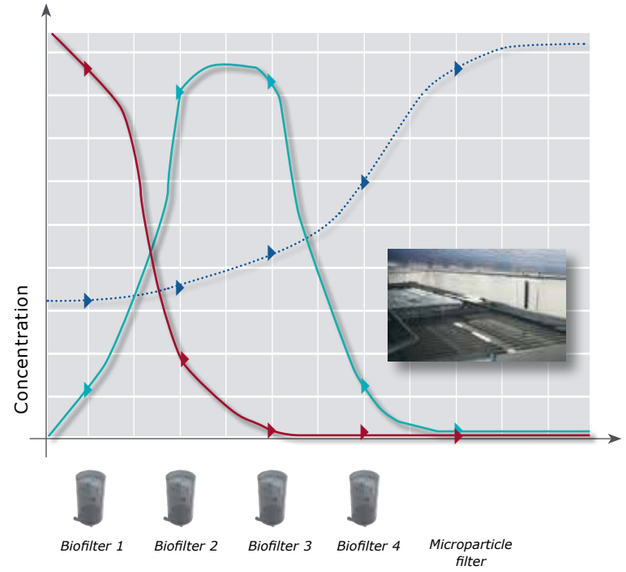
The special construction of the biofilter, combined with the simple, yet clever design of the media, provides an even water flow with maximum bacteria surface contact. The relatively simple design of the media further reduces the demand for biofilter cleaning, which can therefore be fully automated.

AKVA group´s Biofilters creates optimal conditions for nitrification.

AKVA group's multi-step technology provides a stable biofilter performance, even at high pH levels and low total ammonia levels.

Biofilter media

The Microparticle filter provides a very clean water making it easier to maintain visual control over the valuable fish.



- Total Ammonia Nitrogen (TAN)
- Nitrite - N (NO_2)
- Nitrate - N (NO_3)

Conversion of ammonia to nitrite and further to nitrate in AKVA group Reactor Biofilter. Notice! Removal of nitrate does not become effective until TAN is completely removed.

Oxygen Control

High oxygen levels are essential

Oxygenation must be efficient and safe

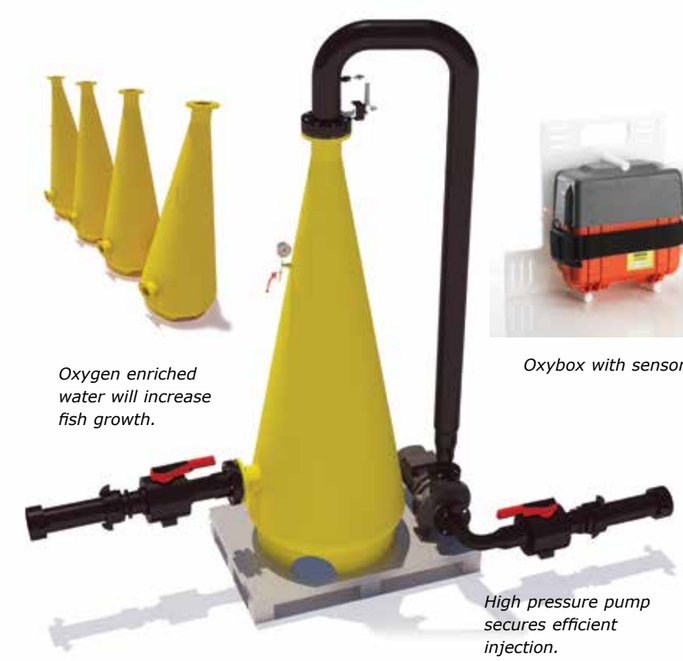
Correct oxygen levels are essential for high fish welfare and growth in all aquaculture systems. In modern farming the use of pure oxygen has become a vital parameter in reaching production goals. Efficient and reliable systems for pure oxygen injection is therefore of utmost importance.

The injection of pure oxygen to the process water can be accomplished in different ways:

- Oxygen Cones operating at high pressure placed centrally or next to each tank to secure optimal mixing of oxygen into tanks.
- Venturi Injectors specially designed for saltwater conditions making use of the jet effect to increase oxygen uptake in the water
- Low Head oxygenation using the higher water pressure at the bottom of wells or shafts to increase the efficiency of dissolving oxygen in the farming system
- Leaky Pipes used for simple diffusion most often used in emergency situations or to handle peak situations for short periods of time.

Oxygen enriched water will increase fish growth.

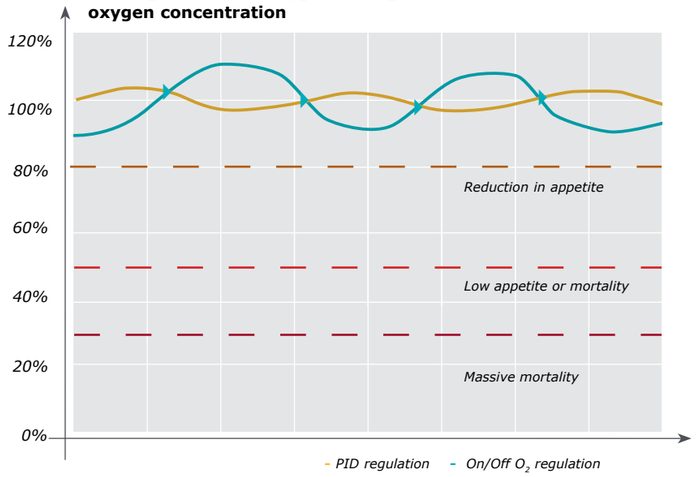
Oxybox with sensors



High pressure pump secures efficient injection.

The new Multi Sensor connects directly to the feed system and can stop the feeding at low oxygen levels.

PID registration of oxygen dosing provides more stable oxygen concentration



If the oxygen supply stops, the oxygen security units will automatically provide extra oxygen.

AKVAconnect oxygen software ensures full control and optimum security.

Detailed oxygen data from each tank on the location.

AKVAflex Recirculation Concept

A safe and flexible recirculation system

All you need in one unit

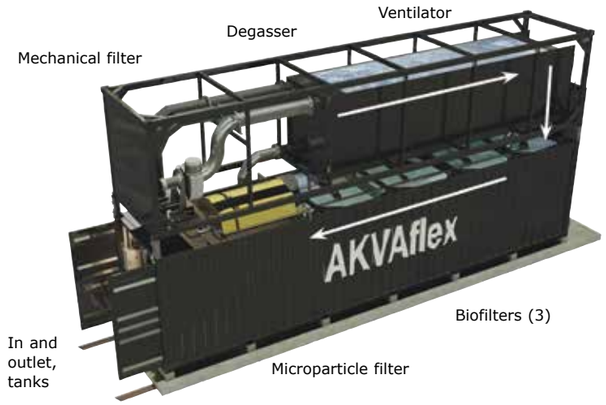
AKVAflex is a new innovative AKVA group concept that integrates our well known recirculation technology and sophisticated AKVAconnect control system in a flexible and easy installation.

As a result of innovation and recent developments it is now possible to get an industrial size recirculation system pre-installed with a minimum on-site setup time, no matter where you want to install it worldwide. Our state of the art recirculation system coupled with the market leading control system AKVAconnect secures an uncontested security in production considering water quality and fish welfare.

If you want to move the unit to another site or recirculate another tank, simply lift the unit to it's new position and hook it up - and you are ready to go!

Installed in a standard container the AKVAflex is easy and cheap to transport anywhere. Everything is pre-installed and secures a smooth installation on-site.

Innovative recirculation system pre-installed with a minimum on-site setup time.



AKVAflex base unit includes:

- 3 Biofilters
- Microparticle filter
- CO_2 Degasser with active ventilation
- Mechanical filter
- Frequency regulated main pumps
- Sludge pump
- Blower for biofilter aeration
- Dosing pump for NaOH addition
- pH, O_2, CO_2 and level sensors
- Alt internal pipe work, all valves and all mechanical installations
- All electrical installations including electrical cabinet
- Complete AKVAconnect control system with computer and sms alarm

AKVA group products fully compatible with AKVAflex:

- UV-system
- Emergency oxygen system
- Oxygen cones and pumps
- AKVAconnect integration of existing solutions and equipment on site
- Measuring probes
- Container based inlet water unit
- Container based heating unit
- Feed systems
- Underwater or above tank lights
- Camera systems

AKVAflex can also be integrated with existing equipment on the site or delivered with additional equipment.

Features:	Benefits:
Modular design	Easily adapted to any farm Easily moved to other locations
Container based	Pre-installed - no concrete work Short installation time on site
Well proven technology	Safe and predictable production with temperature control
AKVAconnect – control system	Flexible control system. Optional equipment can easily be connected
Flexible solution	Possible to attach a wide range of tank sizes

Specifications:	
Daily maximal feed:	225kg feed/day
Flow to tanks:	400m³/h (111 L/s)
Water exchange:	4m³/h (67 L/min)
Energy consumption at full load:	22kW
Connections:	Ø500mm inlet and outlet
Size:	L 13m x W 2.5m x H 4.7m

Feed Systems

Matches fish appetite

The central feed system concept was invented by AKVA group in 1980, and Akvasmart CCS is today the most popular and reliable feed system worldwide. The system is suitable for all species feeding on pellets. It is now also fully integrated with camera control, pellet- and environmental sensors, as well as Fishtalk production control software. All feeding and environmental data is stored in the Fishtalk database. This unique integration allows for full overview and control of all operational activities, from farm site to top management.

The Akvasmart CCS Feed System will feed the correct amount, at the optimal rate, on time, every time. This powerful system provides great opportunities to optimize the entire feeding process.

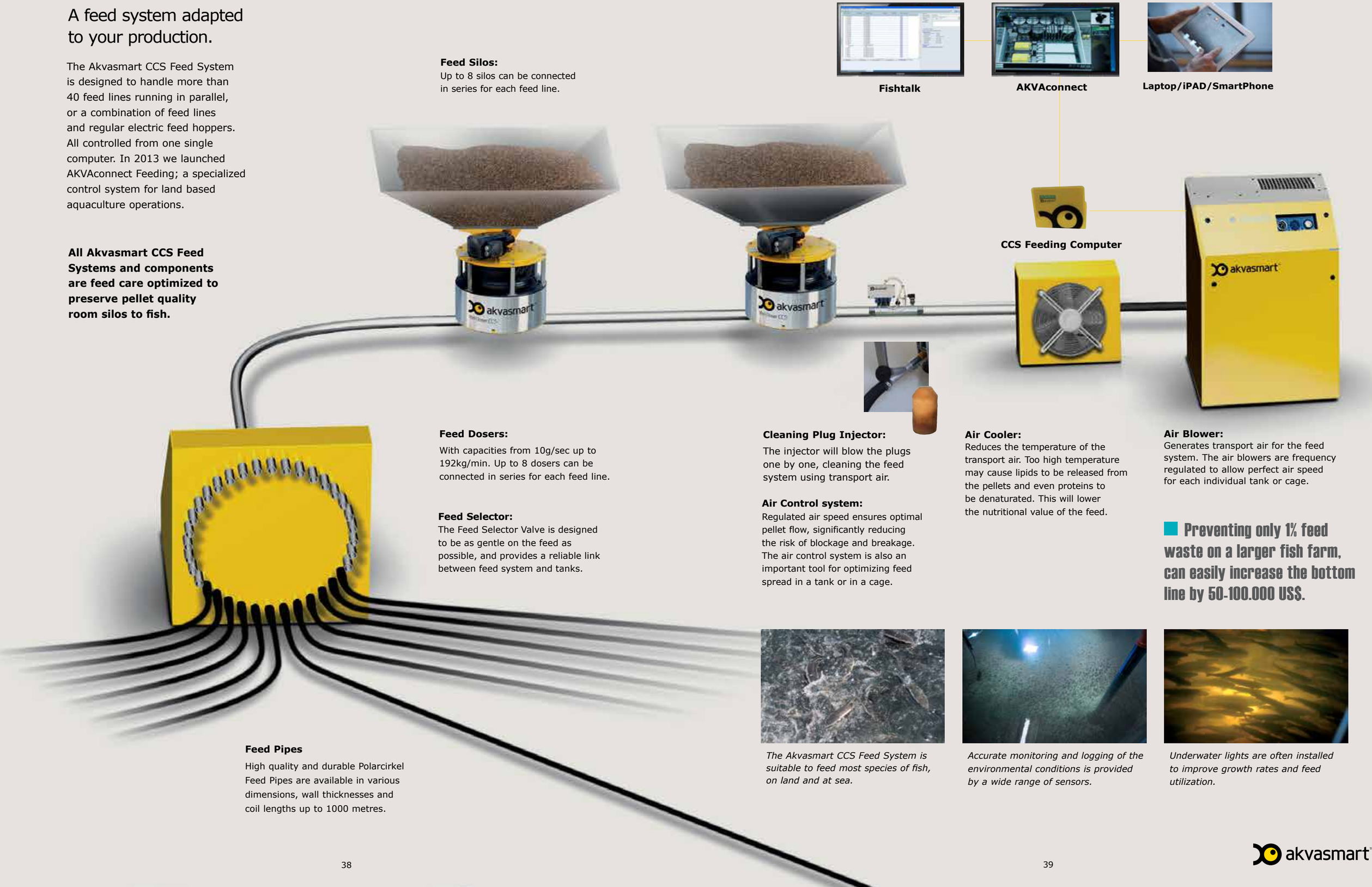
AKVAconnect is the leading edge feed system software, now part of the Fishtalk software family. New functionality includes meal planner, group feeding and adaptive feeding. Combined with data from environmental sensors, this allows for efficient analysis and benchmarking between farm sites.

Akvasmart CCS Feed System

A feed system adapted to your production.

The Akvasmart CCS Feed System is designed to handle more than 40 feed lines running in parallel, or a combination of feed lines and regular electric feed hoppers. All controlled from one single computer. In 2013 we launched AKVAconnect Feeding; a specialized control system for land based aquaculture operations.

All Akvasmart CCS Feed Systems and components are feed care optimized to preserve pellet quality room silos to fish.



Fishtalk

AKVAconnect

Laptop/iPAD/SmartPhone

Feed Silos:
Up to 8 silos can be connected in series for each feed line.

CCS Feeding Computer

Feed Dosers:
With capacities from 10g/sec up to 192kg/min. Up to 8 dosers can be connected in series for each feed line.

Feed Selector:
The Feed Selector Valve is designed to be as gentle on the feed as possible, and provides a reliable link between feed system and tanks.

Cleaning Plug Injector:
The injector will blow the plugs one by one, cleaning the feed system using transport air.

Air Control system:
Regulated air speed ensures optimal pellet flow, significantly reducing the risk of blockage and breakage. The air control system is also an important tool for optimizing feed spread in a tank or in a cage.

Air Cooler:
Reduces the temperature of the transport air. Too high temperature may cause lipids to be released from the pellets and even proteins to be denaturated. This will lower the nutritional value of the feed.

Air Blower:
Generates transport air for the feed system. The air blowers are frequency regulated to allow perfect air speed for each individual tank or cage.

Feed Pipes
High quality and durable Polarcirkel Feed Pipes are available in various dimensions, wall thicknesses and coil lengths up to 1000 metres.

Preventing only 1% feed waste on a larger fish farm, can easily increase the bottom line by 50-100.000 US$.

The Akvasmart CCS Feed System is suitable to feed most species of fish, on land and at sea.

Accurate monitoring and logging of the environmental conditions is provided by a wide range of sensors.

Underwater lights are often installed to improve growth rates and feed utilization.

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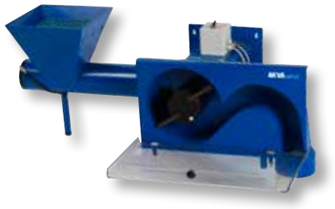
Feed accounts for 60-90% of the production cost in most fish farming around the world today. That makes every pellet count when it comes to financial results.

AKVA group Feed Care Program

Commercial Scale testing

AKVA group has developed a special durability test machine (Doris) that makes it possible for fish farmers and feed manufacturers to test and document the physical quality of different feed types before releasing to the market types. We work closely with expereinced feed suppliers to optimize feed handling.

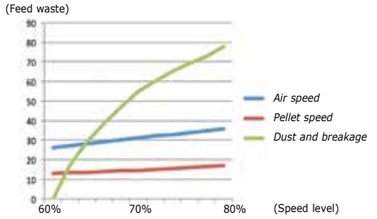


Our patented feed test unit "Doris", is also used by leading fish feed manufacturers and other aquaculture companies.

Video control of the pipes

Monitoring and regulating the transport air speed is one of the most important factors. "Speed kills" also when it comes to feed systems, and only a 10-20% reduction of transport air speed make a significant reduction in feed dust and pellet breakage. This is where most of the feed dust has been created historically. Using the Air Control System combined with our highly effective (low friction start) Rotor Spreaders allow reduction in air speed while still getting excellent spreading.

Centre of Aquaculture Competence, CAC. The world´s largest test site for salmonidae is owned by Marine Harvest, Skretting and AKVA group.



Graph showing how pellet speed influences dust and breakage.

Preventing up to 3% feed waste

It is quite common for many large scale fish farms today to spend 10-20.000 US$ average per day in fish feed. Preventing only 1% feed waste (dust and breakage) can add a total of 50- 100.000 US$ to the bottom line each year! Consequently, it is critical that your feed system reliably deliver the feed to the fish 100% intact, at the correct rate, exactly the amount the fish wants to eat and with the optimal spread.

All feed system equipment is tested by experienced AKVA group technicians to make sure all equipment meet our high standard.

Important elements in the feeding process

- **Feed storage, how to:**
  Fill silo
  Store feed
  Take feed out of silo
- **Pellet transport**
  Pipe work
  Connections
  Adjustment
  Cleaning
- **Air transport**
  Air temperature
  Cooling
  Air speed
  Back pressure
- **Adjustment in control system**
  Feeding speed
  Air speed
- **Feed spreading**
  Type of spreader
  Spreading area
- **General maintenance**
  All equipment

All issues above are down to how to transport the pellet undamaged to the fish!

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The air flow system

Air Blower, Air Cooler and Air Control

Feed Blowers

The blower generates the air pressure to transport the feed to each tank/cage. The combination of an aircontrol system and frequency regulated blowers makes it possible to optimize the pellet transportation. The air speed can be adjusted to optimize both feed spread and gentle feed handling. The blowers are delivered in high quality silencer cabinets which ensures a comfortable work environment.

AKVAconnect provides detailed feeding data from the silos to the cages/tanks.

The feed enters the air flow through the Doser Valves and is then blown through seamless stainless pipes and up to the Selector Valves.

Air Coolers

Depending on the transport distance and ambient temperature, many feed systems will benefit from installing an air cooler.

Too high temperature may cause lipids to be released from the pellets and even proteins to be denaturated. This will lower the nutritional value of the feed.

If the lipids are released from the feed during transportation this will increase the risk of pipes being blocked hence increasing the need for pipe cleaning.

Feed blowers and air coolers come in a variety of models.

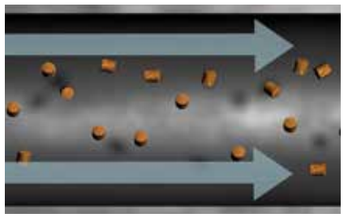
Air Control System

Akvasmart Air Control System with regulated air speed ensures optimal pellet flow, significantly reducing the risk of blockage and breakage. If the pellet/air speed is too low, the risk for pellet blockage is increased. If the pellet/air speed is too high, dust and breakage is increased. The system also monitors and logs air speed, back-pressure and temperature.

The Air Control unit is installed between the Air Cooler and Feed Doser Valve.

The Air Control system is visualized in AKVAconnect through a simple graph per feeding line. The graph displays real-time data for each unit being fed.

Sound protected machine room with Feed Blowers and generators.



The air cooler pipe is cooling the transport air from the feed blower.

Too low pellet speed.

Inspection of a Feed Blower installation, noice cabinets with easy access.

AKVAconnect process control software offers special alarm functions.

Optimal pellet speed.

Too high pellet speed.

A critical part of the feed transport

Dosers and Silos

Feed Dosers
To transport the feed into the air flow with minimal mechanical influence is a critical part of any feed system. A doser is a combination of a dosing unit, with correct amount of feed with the correct speed and a outlet gate that carefully transports the pellets into the feeding pipes.

We can offer both Feed Doser Valves and Feed Augers with Sluice Valves for this purpose. The CCS Feed Doser Valves are designed in three main models. Vari Doser 1500, Vari Doser 1500 Start and Feed Doser 4000.

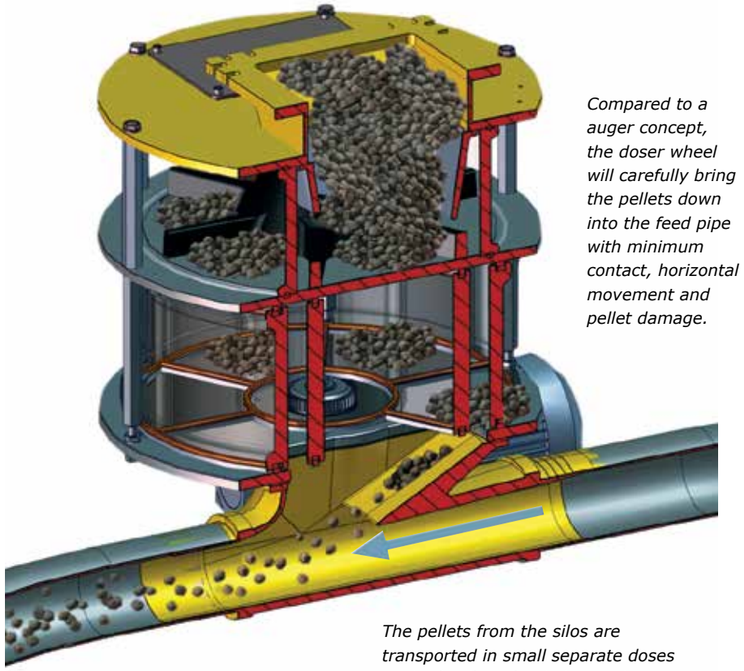
The Akvasmart Feed Doser Valves have capacities from 10g/sec. up to 192kg/min.

Silo Systems

A wide range of different feed tank solutions and sizes can be delivered to suit any requirements. We can deliver square or round tanks in both aluminum and stainless steel. Contact our sales department for more details and specifications.

Feed silos can be delivered in wide range of types and sizes.

A smart silo outlet gate, made from galvanized steel, can easily be installed at the doser top in between the silo flange and feed doser valve.



Compared to a auger concept, the doser wheel will carefully bring the pellets down into the feed pipe with minimum contact, horizontal movement and pellet damage.

The pellets from the silos are transported in small separate doses to the feeding pipe below and out to each site.

Service and cleaning of the feed doser can easily be done in 20 minutes during a feed stop. See more details in our CCS user manual?

Feed Doser:	VariDoser Start	VariDoser	Doser 4000
Min. feed rate (g/sec):	30	100	200
Min. feed rate (g/sec) - pulse:	15	75	150
Max feed rate (g/sec):	400	1250	2500
Material:	Polyethylene (PE) / Cast iron/ Stainless steel		
Weight:	75kgs	75kgs	95kgs

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Feed Selectors

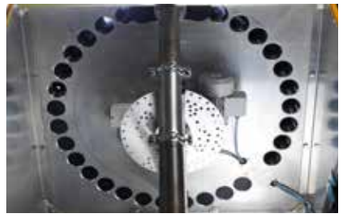
Feed Selector Valve

The Feed Selector Valve is the connection point for the PE transport pipe, located in between the feed silos and the fish tank/pond. The object is to select correct tank/pons so the feed are distributed correctly.

Our product line includes a variety of selector valves both regards to transport pipe size and pipe outlets.

The feed selectors can be tailor-made for all types of indoor and outdoor locations.

Our product line includes a wide variety of Selector Valve models with connections from 4 to 60 feeding pipes.



A new improved construction makes the Feed Selectors easier to open, clean and maintain.

Akvasmart Feed Selectors have a max feeding rate for each feed line of 192kg/min. Up to 60 feeding pipe connections on each selector and pipe lengths up to 1400m.

CCS32 and CCS63 Feed Selector Valves are a perfect solution for tanks, ponds and smaller cages.

Feed Selector	CCS32	CCS63	CCS90	
PE pipe dimension:	32mm (1”)	63mm (2”)	90mm (3”)	
Max pellet size:	5-7mm	9-12mm	25mm (1”)*	
Outlets:	32-60	24-32	4, 10 or 24	
Materials:	Stainless Steel/ Aluminum	Stainless Steel/ Aluminum	Stainless Steel/ Aluminum	
Weight:	45-55kg*	45-55kg*	50-65kg*	

* Depending on model/ex. pipe restrainer

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AKVA basic Feeding System

A complete, portable feed system in one small compact unit, provides better feed control and growth

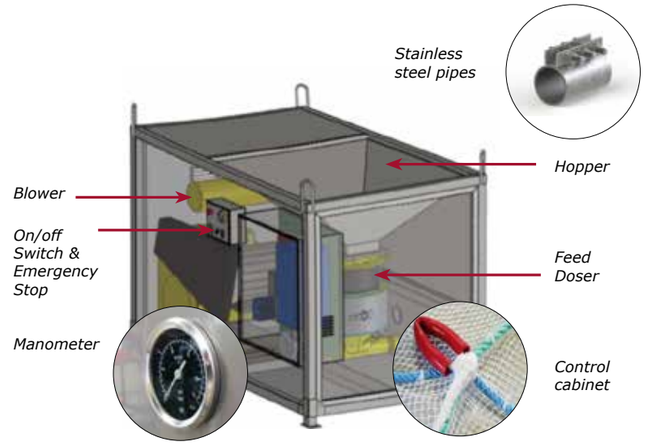
A compact solution for smaller locations

A user friendly and affordable feed system

Semi-automatic feeding system for fish farming. The centralized Feeding system AKVA basic has been specially designed for use in all types of farms due to its versatility in installation, easy operation and maintenance. During feeding, the feed pipe is manually operated by a single person, in communication with a AKVA basic operator in order to coordinate on and off times.

By opening/closing several guillotines strategically located on the system we are able to select the cage to be fed.

The AKVA basic is loaded manually with 20-25 kg feed bags, has a standard capacity of 125 kilos. Silos with extended capacity are available upon request.



The new feeding unit is made of a stainless steel case containing an Akvasmart blower, doser and control cabinet, which makes the AKVA basic a durable and reliable equipment.

Easy installation, operation and low maintenance makes AKVA basic an ideal and reliable equipment on smaller locations or isolated farms.

AKVA basic feed system							Comments
Equipment:	Silo capacity	Feeding pipe	Frequency inverter	Air Cooler	Selector Valve	CCS Control	
Standard *	125kg	90mm	-	-	-	-	Engine and Blower always works at 100% of capacity.
Upgrade 1	300kg	90mm	-	-	-	-	Increased feed capacity in silos.
Upgrade 2	125kg	63-110mm	-	-	-	-	Depends of clients needs.
Upgrade 3	125kg	90mm	yes	-	-	-	Accurate control of line air speed and feed calibration.
Upgrade 4	125kg	90mm	-	yes	--	--	Reduces the temperature in the ail line.
Upgrade 5	125kg	90mm	-	-	yes	-	Equiped with manual control for the Selector Valve. Rotor Spreader can be install in each cage.
Upgrade 6	125kg	90mm	yes	-	yes	yes	Centralizes all parts of the system in one computer.

** The **AKVA basic** standard model´s size is 2x1x1m, manual operation and is equippet with; 22kW Blower, 4000 Doser, On/off Switch, Timer, Manometer and Emergency Stop.*

***AKVA compact** system is larger with 20´- 40´containers, CCS Control and automatic operation.*

Faster and even growth from excellent feed spread

Rugged and user friendly

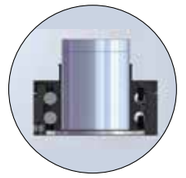
The unique tank version of AKVA group´s famous Rotor Spreader concept provides exceptional circular feed spread in ponds, tanks and smaller cages. This means better and more even growth. All models have adjustable light weight aluminium rotor pipes that allow for lower air speed for start up and rotation. This means less feed fines and breakage, power consumption, back pressure, air temperature, noise and wear and tear on the feed pipes. Our unique ventilated Zenon bearing requires no regular cleaning and does not corrode.

Rotor Spreader designed for tanks, with 32mm or 63mm rotor tip.

The light weight, yet strong construction, ensures reliable performance in rough weather and extreme climates.

The Rotor Spreaders are easy to install and simple to maintain.

Twistable rotor tip in hardened aluminum adjusts spread area.



The new ventilated bearing has extra low friction and requires no regular cleaning!

Rotor Spreader with stabilizing rod designed for cages and large ponds, (63mm, 90mm or 110mm) .

Akvasmart Rotor Spreaders are used in all types of tanks and cages. More than 7500 units have been delivered worldwide.

Rotor Spreader	RS-32T	RS-63T/RS-63C	RS-90C
PE pipe dimension:	32mm (1”)	63mm (2”)	90mm (3”)
Max pellet size:	7mm (3/8”) *	12mm (1/2”) *	25mm (1”) *
Recommended RPM:	50-100 *	50-100 *	50-100 *
Spread diameter (adjustable):	Approx. 3-12m Ø *Approx. 10-40’ Ø *	Approx. 4-12m Ø *Approx. 12-40’ Ø *	Approx. 5-18m Ø *Approx. 16-60’ *
Materials:	Stainless Steel/Alum. Rotor/ POM (Delrin) Polyform buoy	Stainless Steel/Alum. Rotor/ POM (Delrin) Polyform buoy	Stainless Steel/Alum. Rotor/POM (Delrin) Polyform buoy
Height above water:	30cm (12”)	50cm (18”) / 1,2m (4’)	1,2m (4’)
Draft:		- / 1,8m (6’)	1,8m (6’)
Total weight:	0,6kg (1.3 lbs.)	1,2 (2.6 lbs) / 30kg (66 lbs.)	33kg (73 lbs.)

* Depending on feed system and feed type

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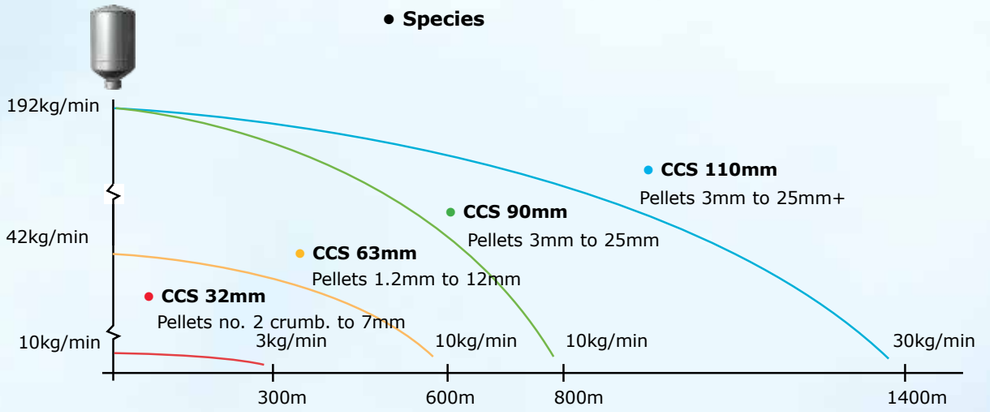
Feed System capacities and transport lengths

The Akvasmart CCS Feed System is designed to fulfill all feeding requirements, regardless of species or how you want to feed your fish.

The configuration of the system is based on the following factors:

- **Transport lengths**
- **Biomass (feed amount)**
- **Number of units (tanks)**
- **Species**



* The capacity of the feed system depends on the technical quality of the pellet, the feeding regime as well as the length of the feed pipe.

Feed System Specifications

System		CCS-32	CCS-63	CCS-90	CCS-110	Comments
Feeding pipe size:	OD (mm)	32 (1”)	63 (2”)	90 (3”)	110 (4”)	Imperial (North America)
Wall thickness:	(mm)	2,9 (0,11”)	4 (0,16”)	7 (0,28”)	6,3 (0,25”)	
Feeding data (for each feed line):						
Pellet sizes: */**	Max.(mm)	5 - 7	9 - 12	17 - 25	25+	
	Min.(mm)	No.2 crumb.	1,2	3	3	This must be evaluated in each specific case.
Max. feeding capacity: */**/***	kg/hour	648	2 520	5 220	5 220	with "VariDoser 1500"
		–	–	11 520	11 520	with ”FeedDoser 4000”
Max. feeding rate: */**/***	kg/min.	10,8	42,0	87,0	87,0	with "VariDoser 1500"
		–	–	192	192	with ”FeedDoser 4000”
Min. feeding rate: */**/***	kg/min.	1,2	2,4	3,0	3,0	
Min. feed dose (single dose) */**	grams	10	20	40	50	with "VariDoser 1500"
		–	–	200	200	with ”FeedDoser 4000”
Transport lengths:						
Max. feed pipe length:	m	300	600	800	1400	*/**
Max. feeding rate at max. feeding pipe length:	kg/min.	3,6	12	36	30	***
Max. feeding rate at half of max. feeding pipe length:	kg/min.	5,4	21	108	150	***
Max. feeding rate at short feeding pipe length */**	kg/min.	10,8	42,0	87,0	87,0	with "VariDoser 1500"
		–	–	192	192	with ”FeedDoser 4000”
Power consumption (max):						
Feed Blower:	kW	7,5	15 - 18,5	22 - 30	45	
FeedSelector Valve:	kW	0,18	0,18	0,18	0,18	
Feeder: FeedDoser/ VariDoser:	kW	0,37	0,75			Max. load/unit
Feeder: Auger & Sluice Valve:	kW	0,37 1,5	0,75 1,5	1,5	1,5	

* Depending on actual transport distance ** Depending on type of feed, technical feed quality, pellet size, feed rates and system settings
*** At continuous feeding **** Depending on actual feeding pipe length

Control Cabinet	Standard 400VAC 50Hz	Comments
Power consumption:	From 8kW to 185kW	Single CCS 32 to Quatro CCS 110
Size:	2100mm x 1200mm x 500mm	HxWxD - in mm
Weight:	From 120kg to 400kg	Single CCS 32 to Quatro CCS 110

PE Feeding pipes	Dimensions				
	OD	ID	Wall thickness	SDR**	Weight/m
32mm	32mm	26,2mm	2,9mm	11	280g/m
63mm	63mm	55mm	4mm	15,75	750g/m
*75mm**	*75mm*	*66,4mm*	*4,3mm*	*17,6*	*980g/m*
*90mm**	*90mm*	*79,8mm*	*5,1mm*	*17,6*	*1390g/m*
90mm	90mm	76mm	7mm	12,8	1900g/m
110mm	110mm	97,4mm	6,3mm	17,6	2090g/m

** Not standard dimensions for Akvasmart CCS Feed System. ** SDR = Outer diameter (OD) / Wall thickness.*

AKVAconnect Feeding Software

Correct amount of feed, always served on time

AKVAconnect is a powerful and advanced software for daily control of all your feeding processes. Combined with Akvasmart CCS Feed System, it is the most adaptable and user friendly system on the market. AKVAconnect is developed in close cooperation with fish farmers all over the world. This has resulted in full integration with camera systems, pellet- and environmental sensors.

AKVAconnect process platform provides full overview and control.

Biological approach

The only feed system software with biomass regulated feeding regimes based on accurate monitoring of fish appetite and environmental data.

Environmental sensor data

Oxygen-, temperature- and current sensors are fully integrated in AKVAconnect. All sensor data are displayed in real time and logged for further analysis. This allows for optimal feeding at all times.

Fishtalk software integration

All data generated in AKVAcontrol is accessible in Fishtalk Control, providing end-to-end production overview, control, analysis, benchmarking and reporting.

The most adaptable and user friendly feeding system on the market.

All feeding data is easily accessible in Fishtalk Control.

Alarm output to site alarm.

The feeding can be remote controlled from an iPad or smartphone.

Accurate monitoring of fish appetite.

Environmental data displayed in real time and logged.

Automatic or manual camera selection.

Feeding according to received data.

Key functionality:

- Full farm overview at a glance
- System capacity planning
- Advanced meal planning
- Multiple group feeding regimes
- Hopper control
- Integrated feeding camera control
- Accurate Air Control System
- Powerful reporting and analysis tools.
- Wizards

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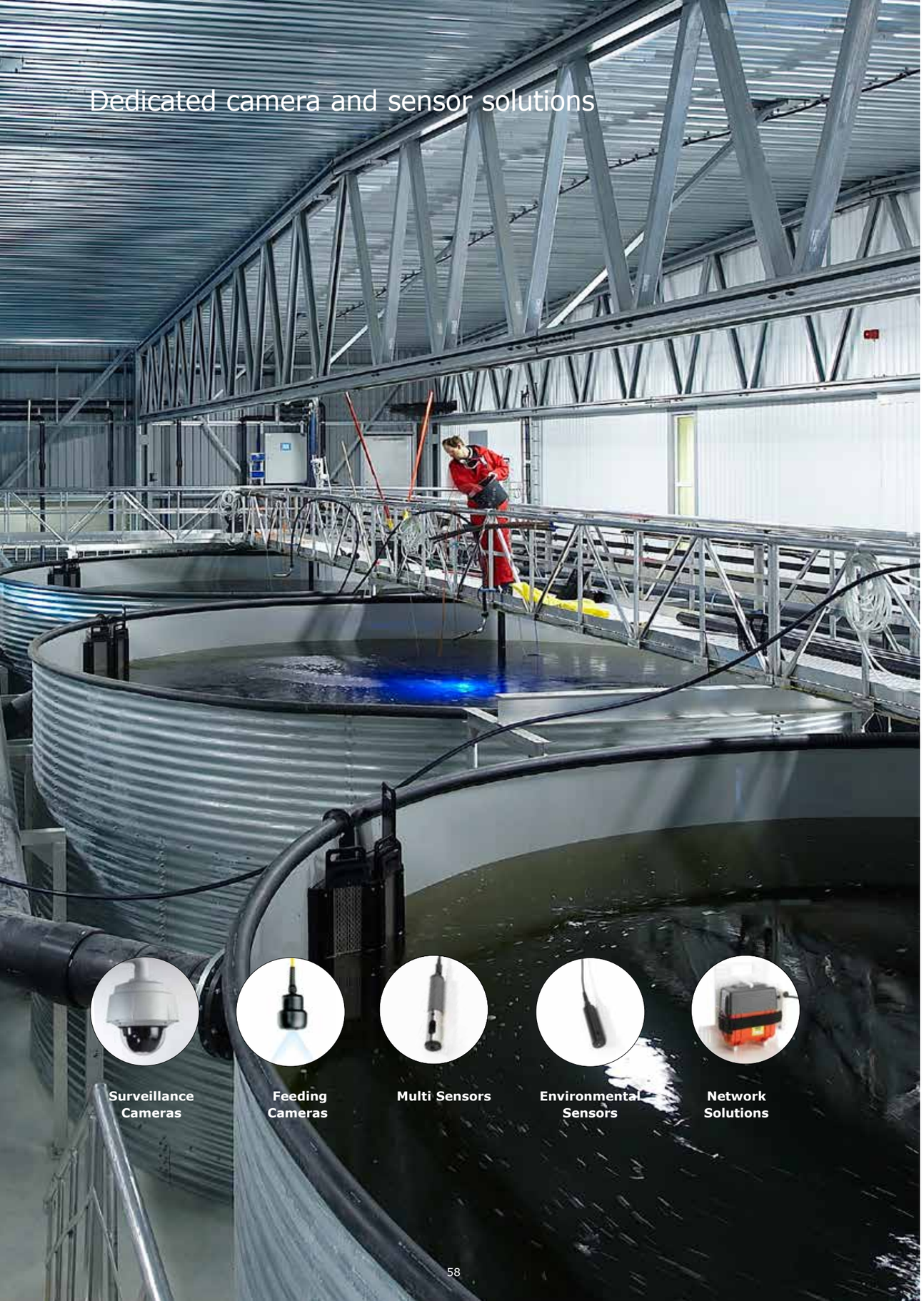
Camera and Sensor Systems

Full overview, complete control

Akvasmart’s advanced video camera and sensor systems monitor both the fish and the feeding process. This ensures optimum operations and a healthy environment for the fish.

Flexible camera solutions provides crystal clear images. Transmission of surface and underwater video images, feeding- and environmental data to the farm base.



Underwater- and surveillance cameras

Akvasmart cameras have been produces over 20 years. Based on this experience AKVA group has a wide product range of cameras from basic fixed monochrome and dual pan/tilt colours to surveillance cameras tailored for fish farming.

Akvasmart Cameras can be used to monitor:

- **Feeding activity**
- **Fish maturation**
- **Fish behaviour**
- **Morts at the cage bottom**
- **Pipe system**
- **General surveillance**

Akvasmart cameras provides perfect overview and ensures fast and accurate camera control.

AKVA group offer a wide range of cameras, from affordable monochrome solutions to advanced colour cameras.

An important part of the sensor and cameras is the infrastructure that transmits the signals/video from cage to office. In the Akva-smart system there are several possibilities either wireless or with cable.

Crystal clear video images, even during poor light and visibility conditions.

Environmental Sensors

Environmental sensor data is becoming an important factor in fish farming, to know the environment will always improve your production.

Every pellet counts

Feed accounts for 60-90% of the production cost in most fish farming today. That makes every pellet count when it comes to financial results.

The first parameter measured is temperature - to know the water temperature helping to decide when to feed. The second parameter is oxygen, an important parameter when decide when to feed. It will stop the feeding at low oxygen levels in the water.

Optimal environmental conditions will allways reduce the mortality and increase the growth.

Using environmental sensors combined with AKVAconnect will monitor and control secure the stability in your system.

Environmental data are important and a critical feeding parameter that will prevent unnecessary feed waste.

There are increasing numbers of parameters that helps the fish farmer know the environment of the fish. This knowledge is an important factor in industrial fish farming.

Dedicated environmental sensors will provide accurate level data of oxygen, pH ammonia, nitrogen and salinity.

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Environmental Sensor Specifications

Temperature - the foundation for all feeding regimes and growth models

A separate sensor that need to be connected for the AkvaControl system, either in the EAP or in the SmartBox (or be connected to the selector valve). For AKVAconnect and Oxybox the sensor is inside an Oxygen sensor.

Oxygen – an important factor for growth and fish welfare

The oxygen sensors are with optical reading which reduces the need of calibration and maintains high accuracy and operates with no drift over long-term deployments. On the Oxygen RDO all this information is stored in the replaceable CAP tip. The optical sensors have a fast respons and maintains stability, even in dynamically changing conditions.

Environmental current knowledge prevent feed waste

An important parameter is the current or water flow when you feed but also to know your site. We can offer two types of current sensors, the Tilt sensor that gives current speed in one layer and the Doppler current profiler that gives you speed and direction at three different levels in the water column.

Full environmental overview - know your site

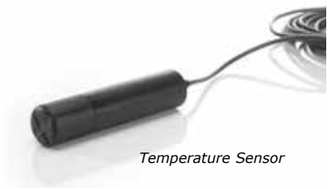
The new Multi Sensor is a compact instrument that houses six water quality sensors and measures 12 parameters: • Actual and specific conductivity, salinity, total dissolved solids, resistivity, and density • Dissolved oxygen • ORP • pH • Temperature • Water level and water pressure (absolute)

Temperature Sensors	Separate	Inside
Resolution:	+/- 0.1° C	+/- 0.1° C
Accuracy:	+/- 0.5° C typical	+/- 0.1° C typical
Operating temp.:	0-50° C / 32-122°F	0-50° C / 32-122°F
Depth rating:	30m ltd. by cable	210m ltd. by cable
Housing:	Bronze	Polyethylene
Cable:	30m urethane	30m urethane

Oxygen Sensors	RDO sensor	Sensor OxyBox
Accuracy:	+/- 0.1mg/L 0-8mg/L +/- 0.2mg/L 8-20mg/L +/- 0.10% 20-50mg/L	+/- 0.1° C typical
Operating temp.:	0-50° C / 32-122°F	0-50° C / 32-122°F
Depth rating:	210m ltd. by cable	300m ltd. by cable
Housing:	Polyethylene	Polyethylene
Cable:	10 or 50m	10 or 50m

Current Sensors	0-50cm/sec	0-100cm/sec
Accuracy:	+/- 0.1cm/sec	+/- 0.2cm/sec
Measurement range:	0-50° C / 32-122°F	0-50° C / 32-122°F
Measuring principle:	Electronic tilt sensor	Electronic tilt sensor
Power consumption:	75mA	75mA
Depth rating:	Polyethylene	PE/alu. or SS wings
Housing:	Acrylic/Pom/Alu.	Acrylic/Pom/Alu.
Cable:	30m Polyethylene	30m Polyethylene

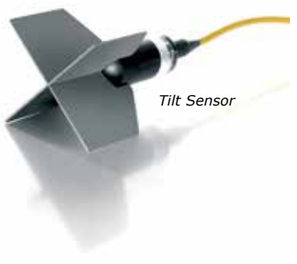
Multi Sensor	
Supported parameter:	Actual conductivity, specific conductivity, dissolved oxygen, pH, OPR, temperature, water level/depth/pressure (absolute)
Oxygen:	+/- 0.1mg/L 0-8mg/L +/- 0.2mg/L 8-20mg/L +/- 0.10% 20-50mg/L
Conductivity:	+/- 0.5% +1uS/cm typical +/- 1% max range
ORP:	+/- 0.5mV
pH:	+/- 0.1 pH unit
Temperature:	+/- 0.5° C
Housing:	PVC, acetal, titanium, 316 stainless steel



Temperature Sensor

RDO Sensor

Sensor OxyBox



Tilt Sensor

Multi Sensor

Infrastructure for cameras and sensors

OxyBox - ideal for accurate environment logging and site surveyor

No need for additional infrastructure, the system has build in Iridium communication and battery. One standard unit and optional number of sensors

CAP and SmartBox - wireless infrastructure for cameras

A connection point for both all our underwater cameras and winch. With transmission of up to 6 parallel video channels the system suits all type of farms.

CSU - Wireless infrastructure for both HR cameras and sensors

One connection point for camera and sensors as oxygen, current, temperature and Doppler Pellet Sensor. With transmission of up to 6 parallel video channels the system suits all type of farms

Hard wired solutions - when stability and flexibility counts

Infrastructure that fulfil your need for flexible solutions. Adapted and customized for each site – various sensors and camera can be adapted to the system.

OxyBox	
Iridium communication:	Standard
Doppler Current sensor/profiler	Optional - 1 sensor
Oxygen Sensor	1 - 3 sensors
Power supply:	Internal replaceable battery 3 - 6 moths lifetime

Model	SmartBox	CAP
Video:	Maximum 6 parallel channels	
Above water camera:	In front	In the top
Under the water:	All models of our underwater cameras	
Camera Winch:	Standard	HT Winch
Power supply:	Battery (12V) or mains 230V	
Housing:	Aluminum/ Delrin	Aluminum/ PC/Stainless steel

Model	CSU
Video:	Maximum 6 parallel channels
Above water camera:	In front
Under water:	All our models of underwater cameras
Winch:	Standard Winch
Power supply:	Battery (12V) or mains 230V
Sensor:	Aluminum/ Delrin

Hardwired transmitter	
Wired network:	Ethernet 100/1000Mbit - customized solutions, depend of site layouts and distances Ethernet, Coax or fiber cables.
Above water camera:	Surveillance camera with P/T/Z
Under water:	All our models underwater cameras
Winch:	Standard and Winch HT
Sensors:	Both Optical Oxygen sensor and temperature sensors and either current sensor – tilt or Doppler pellet feed sensor
Power supply:	Mains 230V

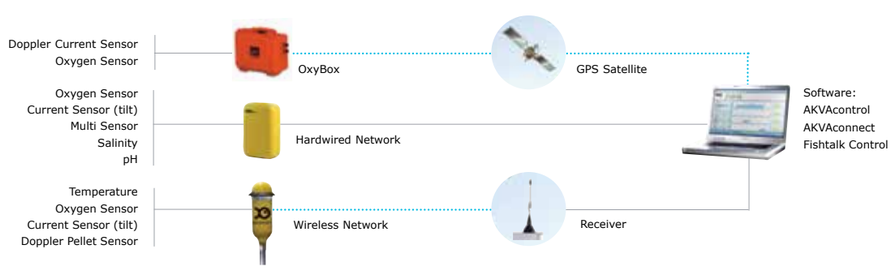
OxyBox

CAP

SmartBox

CSU

Wired Network



Crystal clear and simpel first choice

Basic HR Feeding Camera

Basic HR Camera

The Basic HR Camera is simple, reliable and affordable mono-chrome camera and a smart choice if you need many cameras.

Akvasmart HR models are the world's most popular camera series. The HR cameras can be operated from the tank, feeding control room or via the Internet. One camera is usually permanently installed in each tank or pond.

HR Cameras are a flexible and affordable camera solution for tanks and ponds.

The HR models are the world's most popular camera series.

Robust and waterproof connection cables.

Cameras, cables and connection plugs are pressure tested down to 40 metres to ensure that the equipment is 100% pressure proof.

Akvasmart's advanced video camera and sensor systems monitor both the fish and the feeding process.

You can view and remote control our video cameras from android, iPAD or PC via internet.

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SmartEye Surveillance Camera

Detects predators and unwanted visitors and increase safety when working alone on site.

Full overview of your sites

The SmartEye Surveillance Camera provides better control over unwanted visitors, predators, feed spread or simply added safety when working alone at the farm. This is an advanced surveillance camera with clear colours and unique functionality, that can be operated from the control room or via the Internet. The 24x optical zoom provides detailed information from your farm.

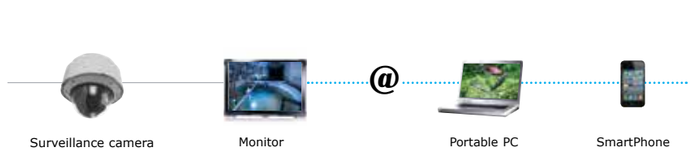
Detect unwanted visitors. Birds and other predators can cause considerable damage to your stock.

You can easily zoom in from a wide-angle to view the details you want to see.

SmartEye Surveillance Camera provides crystal clear colour video images, even during poor light and visibility conditions.

The camera can pan 360°, and tilt 90°.

Surveillance camera with 90° to 10° zoom (24x optical).



Camera Specifications

Cameras	Basic HR	Surveillance		
Colour:	Monochrome	Colour	Colour	Colour
Type:	Analog	IP	IP	IP
Resolution:	600 TVL	HD 720p	HD 720p	HD 720p
Angle of view:	Fix: 72	52°-4,4° optical	Fix: 84° dig. zoom	Fix: 84° dig. zoom
Cable:	50m (165') PUR	> 100m	> 100m	> 100m
Depth rating:	100m (323')*	Outdoor IP 54	Outdoor IP 54	Outdoor IP 52
Power:	12V DC	PoE	PoE	PoE

* Limited by cable

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Vicass HD Biomass Estimator

Measures length and height with high accuracy

The new **Vicass HD (High Definition)** will provide farmers with accurate and efficient biomass estimation, taking high quality digital stereo images of the live fish swimming in the cage.

The images are analyzed in order to determine average weight of each fish. Vicass HD has high accuracy, capacity and speed and the camera unit captures 300-500 images at three different depths before they are analyzed.

The red graph is here showing calcultated fish weight in different weight classes.

Accurate biomass estimation, taking high quality digital stereo images of the live fish while swimming in the cage or tank.

New Vicass features:

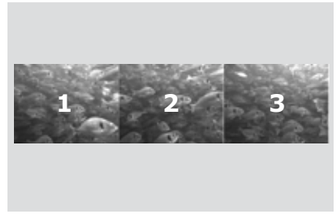
- Possible to zoom images for exact data input.
- The weight distribution curve is continuously updated while fish is being entered/recorded by clicking.
- Measures fish sizes at a distance from 60cm up to 2m from the camera.
- Better image overlap because lenses on the new camera are located as little as 15cm apart.

Vicass HD estimation

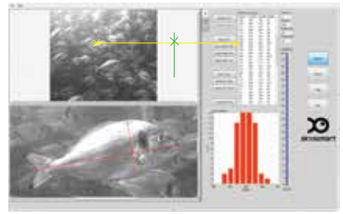
A stereoscopic video image measures the height and length of each fish. Advanced geometry algorithms accurately calculate the live weight of the fish.

Models are now available for species like:

Atlantics, Chinook, Coho, Tasman Salmon, Rainbow Trout, Altantic Haddock, Red Sea Bream, Med. Sea Bass/Bream, Striped Jack, Yellowtail, Japanese Amberjack and Southern Blue Fin Tuna.

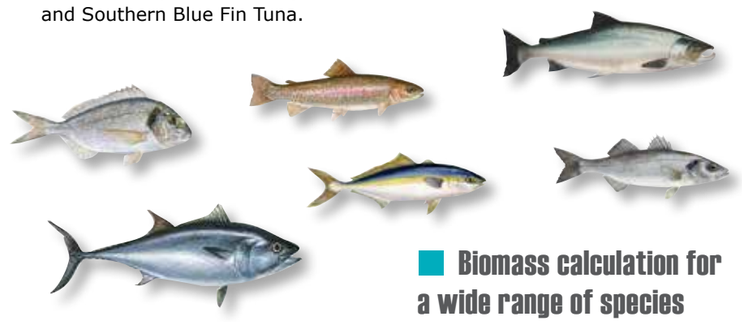


Grabbing of images



Analyzing

Reporting



Biomass calculation for a wide range of species

Vicass HD	
Power supply:	4A
Ingress protection:	Camera unit: IP68
	Field computer lid open + plugs inserted: IP64
	Field computer, lid closed: IP67
Camera size: length/ width/height - weight:	515mm x 130mm x 195mm - 16kg
Field computer size: length/ width/height - weight:	485mm x 392mm x 195mm - 12kg

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Underwater Lights

Stable and accurate lighting increases profits

The correct use of underwater lights for many aquaculture species, ensures reduced fish maturation. In addition it results in faster growth and more effective feed utilization. The Idema Underwater Lights series are adapted for smolt and juveniles in small tanks, as well as for salmon, cod and other fast growing species that require light in larger farms. The high quality underwater lights have excellent light distribution, which allows for easy bulb replacement, functional design and a rugged construction. The power is connected to the underwater light through a standard IP67 plug, enabling simple installation. The standard cable length are 35 or 55 meters. Idema Underwater Lights are the ideal tools to help improve yield and profits.

- Quality is always profitable!

High quality underwater lights

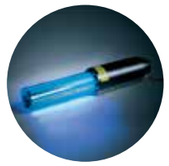
BlueLED and metal halogen lights

For indoor locations we recommend 100W to 400W illumination. BlueLed or SubLite 250W/400W is the smart choice here.

Light treatment is also successfully used for smolt and juveniles in tanks and cages of different types and sizes.

Accurate even light distribution throughout the biomass is vital in tanks with high density and humus loaded water.

Idema Underwater Lights can easily be installed in most sites, ensuring stable and accurate light distribution.



Expected service life on the LED bulbs is in the region of 50.000 hours!

ISO approved Pyro Borosilicate glass to withstand rough use in cage farming operations.

Idema BlueLed 100W

Standard 35m or 55m rugged underwater cable (urethane cable), and a waterproof connection plug.

An extra strong construction that is almost maintenance free.

Idema SubLite 1000W

Idema BlueLED 400W is a perfect light solution for cage farms with medium or large cages.

Idema Underwater Lights are often used for salmon, trout, cod and other fast growing species.

Idema Underwater Lights are a smart solution in Artic areas where the light conditions are poor in the winter time.

More than 16.000 Idema Underwater Lights have been delivered world wide in the last 15 years.

Up to 8 times stronger light effect with the new BlueLed 400W!

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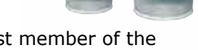
Bright solutions for a wide range of tanks and cages

BlueLED 100W with blue light rays, have the highest penetration in seawater, and therefore the greatest efficiency. LED (Light Emitting Diode) is often called ´eternity light´ and is the most cost effective light solution on the market – and a perfect match to a diesel generator. The light diodes have extremely long duration with a predicted service life of up to 50.000 hours! Which means; no bulb changing for many years ahead. Recommended use: Tanks and smaller cages.

NEW BlueLED 400W with blue light rays is our newly developed luminaire for the sea cages. This luminairie is utilizing the newest High Intensity LED-technology with almost four times more effective light source than the BlueLED 100W. The blue colour has proven to be the most efficient when it comes to effect on biology in the fish. LED luminaires can provide more effective output from each luminaire compared to other lamp technologies. It saves cost on power generators, less power use and uses less copper in the installations. All this in addition to a long service life of the luminaire. Recommended use: Medium and large cages.

SubLite Integra 250W/400W is the smallest member of the SubLite family. The light can be offered in two luminosities for smolt, juvenile and smaller locations. This model is often used in cod farming with lights placed at various depths for a smooth distribution of light all over the cage. The light bulb and the electronic control device is integrated in the housing compartment and has a service time in the region of 5.000 hours. Recommended use: Tanks, smaller and medium cages.



SubLite Integra 1000W is our bestseller for salmon farms and the most rugged light unit in the market. It is placed at various depths and the powerful light ensures an excellent spread. The light bulb and the electronic control device is integrated in the housing and is easy to install. This unit also has a service life in the region of 5.000 hours. Recommended use: Medium and large cages.

SubLite Standard 2000W - the most powerful solution we offer. It provides extra strong lighting in large cages where there is a need for strong light conditions without using a lot of separate units. It features solid construction with a separate connection box and a service life in the region of 5.000 hours. Recommended use: Large cages.

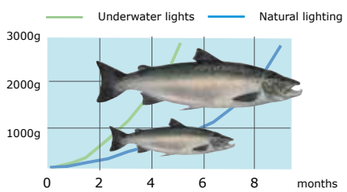
Underwater Lights Specifications

Specifications:	BlueLed 100W	BlueLed 400W	Integra 250/400W	Integra 1000W	Standard 2000W
Operating voltage:	230 VAC/50Hz (24DC)	230 VAC 50Hz (60DC)	230 VAC 50Hz	230 VAC 50Hz	230 VAC 50Hz
Starting current 0,5 second:	1,0A (230W)	1,8A (400W)	2,45A (563W) / 3,0A (690W)	8,0A (1840W)	13,0A (2990W)
Starting current 1 second:	2,5A (115W)	1,8A (400W)	1,9A (437W) / 2,0A (460W)	6,4A (1472W)	12,1A (2783W)
Operating current (2 minutes):	0,5A (106W)	2,15A (480W)	1,3A (299W) / 1,8A (414W)	5A (1150W)	9,35A (2150W)
Total efficiency:	115W	480W	275W / 460W	1065W	2070W
Service life with even colour:	appr. 50 000 hours	appr. 50 000 hours	appr. 5000 hours	appr. 5000 hours	appr. 5000 hours
Light source:	1080 LED	184 LED	HQI-T 250D / HQI-T 400D	HQI-T 1000D	HQI-T 2000D
Color temperature (Kelvin):	20000 K	20000 K (480 nm Blue)	5300K / 6100K	6000K	4400K
Luminosity:	-	-	20 000 Im / 35 000 Im	85 000 Im	190 000 Im
Weight, light housing:	8,5kg	11kg	7kg / 10kg	21,6kg	11kg
Weight, with cable:	14kg (appr. 2 l. oil)	19kg (appr. 2 l. oil)	11kg / 14kg	28kg	17kg
Weight, connection box:	-	-	-	-	19,2kg
Size, length + Ø:	641mm + 120mm	641mm + 120mm	648mm + 140mm	818mm + 180mm	642mm + 140mm
Material in the main housing, density:	POM 1,41g/cm³ DIN 53479 - L15	Aluminum 6082 T6 2,7g/cm³	POM 1,41g/cm³ DIN 53479 - L15	POM 1,41g/cm³ DIN 53479 - L15	POM 1,41g/cm³ DIN 53479 - L15
Material in connection box:	-	-	-	-	Fire coated aluminum
Pyro Borosilicate glass 3.3:	ISO 3585- 2,23 g/cm³	ISO 3585- 2,23 g/cm³	ISO 3585- 2,23 g/cm³	ISO 3585- 2,23 g/cm³	ISO 3585- 2,23 g/cm³
Cable, standard lenght:	PUR 3G1,5 35m or 55m	PUR 3G1,5 35m or 55m	PUR 3G1,5 35m or 55m	PUR 3G2,5 35m or 55m	PUR 3G2,5 35m or 55m
Cooling fluid:	Silikon fluid	Silikon fluid			
Recommended use:	Tanks /smaller cages	Medium & large cages	Tanks /medium & small cages	Medium & large cages	Large cages

Blue light *Daylight*

Note: Specifications are subject to change without prior notice.

We base our CE- marking on tests run by Nemko according to the EMC and LVD directives.



By using extra light on i.e. salmon, you will achieve faster growth and get higher harvest weight as opposed to not using underwater lights.

A wide range of smart camera and sensor solutions provide full overview and control of the biomass.

AKVA group offer a regular service visit with equipment control and maintenance, including a detailed status report.

akvasmart™

Production and process control software

Intelligent IT solutions

AKVAconnect, Fishtalk and Wisefish are unique tools that integrate fish farming operations. This ensures optimum efficiency, excellent fish quality and increased profitability. The software covers all needs for process control, production control and planning.

Fishtalk: This software covers most aspects of the biological production control and planning, as well as production costing and budgeting. Reports and analysis are the basis for decisions, both long term and short term, and provides historical overview, status and prognosis.

Wisefish: Gain complete control of costs with the ability to apply detailed costing at the site or even cage level. You can easily manage the complete cycle from smolt to harvest and delivery to the customer and capture a detailed fish history.

AKVAconnect: A software platform that is designed for optimal control of the processes and activities on fish farms. The system offers full control, surveillance and integration of machines, sensors and all processes on both sea and land based fish farms.

Complete software solutions from AKVA group

Fishtalk

AKVAconnect

Wisefish

Complete Value Chain Control

A result of more than 35 years of aquaculture experience

Our software is in use by most Norwegian aquaculture companies, a strong testimony to the fact that AKVA group offers aquaculture software solutions that are second to none! Fishtalk software gives a fast and detailed summary of when the fish will be ready for the market, as well as trends in production costs over time. Easily view, through simulating changes in growth conditions, the environment, feeding regimes, feed prices, smolt costs, harvests, and numerous other planned or simulated factors, the biological and financial consequences of changes in underlying conditions.

Full control from broodstock to customer.

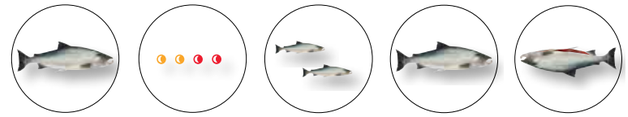
An interactive control platform

AKVAconnnect provides the ability to gather data and combine information from all levels of your aquaculture operations, including controlling and monitoring all technical processes. This improves management´s production overview and control. AKVAconnect also provides the maintenance team with dedicated logging of all parameters associated with the equipment on site.

AKVAconnect allows full process control via internet on a PC, iPAD or Smartphone.

Fishtalk – From broodstock to harvest

Fishtalk captures data from broodstock to harvest and has powerful reporting and analysis capabilities. With the financial and planning modules Fishtalk becomes a primary tool, from day to day use on a single site tomapping out a 5-year plan for the whole company.



Broodstock | Hatchery | Juvenile | On-growing | Harvesting

Wisefish - Fully integrated end-to-end ERP solution

Combine fish stock inventory details captured in AKVA group's premier Fishtalk software with the advanced accounting features of Wisefish. Capture the total Cost Of Goods Sold of live fish stock inventories, distributed down to the site or even cage level.

Processing | Logistics | Sales | Customer | Tracking

AKVAconnect - Process control platform

AKVAconnect software is designed for optimal industrial control of the processes and activities on fish farms. The system offers full control, surveillance and perfect integration of machines, sensors and all processes on a fish farm.

Current control | Oxygen control | Temperature control | Camera control | Alarm system

Underwater Lights | Feed control | Salinity | Water quality | pH values

Production control and planning

Dedicated software ensures safer and more cost effective solutions.

From Broodstock to Harvest

The Fishtalk-family

We often say that the modules in Fishtalk are seamlessly integrated. But **Fishtalk Control**, **Plan and Finance** are in fact part of the same software. Shared by the modules is one single database containing all data, as well as common functionality and models. This resulting in a better user experience and more consistent software.

Biology and finance, past and future are dimensions that goes hand in hand in Fishtalk. The reporting and analysis tools greatly demonstrate the effect of including all 4 areas in the same software solution.

Effective and accurate control, budgeting and planning.

Additional modules like **Fishtalk Connect** will provide a version stable interface to third party applications like Business Intelligence or reporting tools. It also contains **OLAP** cubes using **Microsoft Analysis Services**. The cubes are already prepared to go with data from Fishtalk, giving you the option to integrate using standards like Excel and similar.

Other Fishtalk software solutions

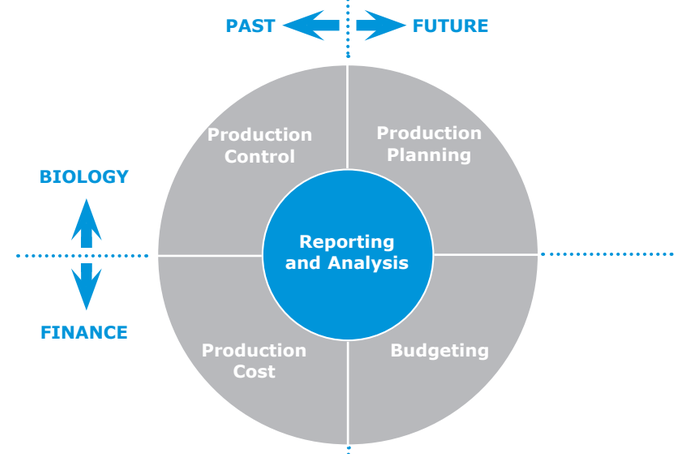
Fishtalk Lice and Fishtalk Wrasse will greatly improve your overview of the lice situation, and with **Fishtalk Tide** you can plan activities taking the tide level and current into consideration. You may use **Fishtalk Benchmarking** to benchmark your production, and finally **Fishtalk Broodstock** closes the loop, giving you full traceability across generations - down to individual level!

Fishtalk Control

Fishtalk Control software provides producers complete control of the production from broodstock to harvest. Used by single sites as well as large corporations, Fishtalk is the most complete production control software in the market.

Fishtalk Plan

Fishtalk Plan is a user friendly tool for production planning. Yet it includes advanced features such as rolling forecasts, scenarios and flexible plan structures, making it a more powerful tool. The flexible reporting system helps you take operational decisions by comparing different scenarios efficiently.



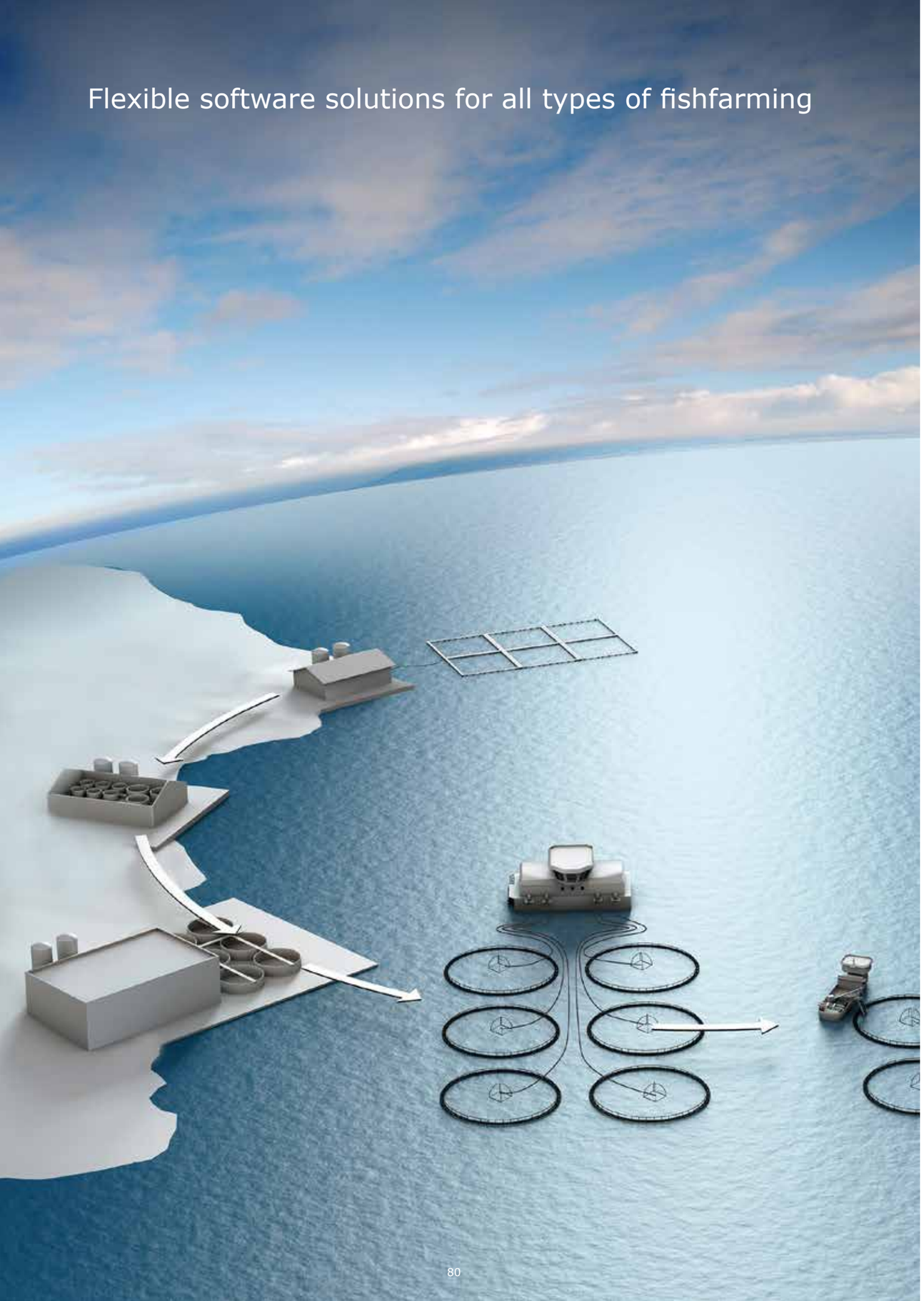
Fishtalk Finance

Production cost calculation is easy with Fishtalk Finance. A minimum of setup is required, and you will be up and running in no time. Simply import data from accounting once a month and you will easily obtain new insight into your cost of production.

Fishtalk Finance

Budgeting using Fishtalk Finance is simpler than ever. Just define your cost models and any production plan can be used to generate the major cost factors like feed, transport and harvest. Comparing budgets generated from different scenarios quickly gives you the financial impact of your decisions.

The Fishtalk-family software ensures complete value chain control.



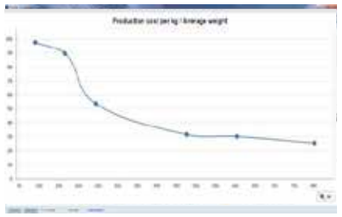
The Fishtalk-family

Fishtalk Control

Fishtalk Control provides a complete overview of the biological status of the production. The tool keeps track of all activities through the sophisticated log; from unit and farm level, to top executive management.

Fishtalk Plan

Fishtalk Plan provides optimal production plans according to your strategies. This gives you a unique basis for making qualified operational decisions based on various scenarios for each species.



Fishtalk Finance

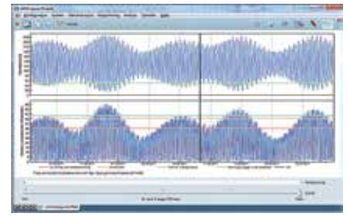
Fishtalk Finance enables simulation of the financial effects of the planned activities. The solution provides in-depth information according to the biological plans, budgets and forecasts, - all based on a set of different scenarios.

Fishtalk Lice

Fishtalk Lice shows lice developments and effect of treatments for each cage or region. Fishtalk Wrasse provides stocking numbers for each cage and percentage of Wrasse vs. salmon.

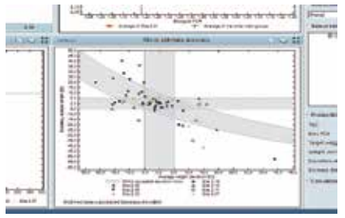
Fishtalk Wrasse

Fishtalk Wrasse ensures a full updated overview of the treatment. The module extends the lice module in Fishtalk and provides an unique tool for monitoring and analysing.



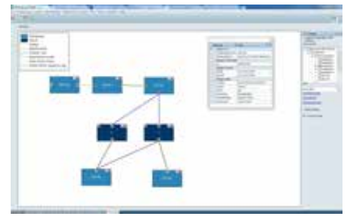
Fishtalk Tide

Fishtalk Tide provides predicted hourly tide levels and change in tide level. This makes it easy to plan operations that depends on slack tide and low currents, like net changes and lice treatments.



Fishtalk Benchmarking

Fishtalk Benchmarking provides fast and simple rankings compared to established production goals, such as growth rates, feed conversion rates, hit rates and other KPIs as VF3 and SGR.



Fishtalk Broodstock

Fishtalk Broodstock seamlessly integrates broodstock and production control, and provides full traceability to genetic origin and across generations of broodstock.
It captures group level information as well as data for individual fish, like genetic markers and quality samples.

Fishtalk Equipment

The new Fishtalk Equipment software organizes all the farming equipment with documentation and maintenance, maintaining full traceability on component level. Comply with the Norwegian NS9415:2009 and NYTEK.

For more detailed software information, please visit:
www.fishtalk.com

fishtalk™

The world´s leading ERP solution for seafood

The Wisefish software family

WiseFish is developed as an industry-specific layer built on the backbone of Microsoft's business solution software – Dynamics NAV. Dynamics NAV brings together finance, manufacturing, customer relations management, analytics and e-commerce with a core, world class accounting system.

Wisefish - award winning ERP software.

The leading ERP solution for seafood producers, distributors, processors, brokers and traders

WiseFish, Certified for Microsoft Dynamics, is a comprehensive family of software products that combine the best of standard Microsoft Dynamics NAV with a wide range of seafood industry-focused packages and business intelligence analytics tools. Take advantage of role tailored, information-driven workflow which supports your business goals:

- **Innovative industry solutions for the entire seafood value chain.**
- **Built on Microsoft's Dynamics NAV**
- **Processing, Planning, and Demand Forecasting**
- **Lower inventory costs and improve food safety with integrated HACCP-compliant Quality Control**
- **Inventory managed by both catch weight and regular weight**
- **Primary processing and Value added production tools**
- **Industry-specific functionality straight out of the box**

For more detailed software information, please visit:
www.wisefish.com

Wisefish Aquaculture

Account for live fish stock inventories from smolt to harvest and beyond using advanced financial forecasting and cash flow management tools, complete vendor and customer management, HACCP-compliant quality control, and end-to-end traceability.

Wisefish Quality

Easily manage increasingly stringent legislated and customer mandated rigorous quality control through third party audits, SQF, or other recognized programs. WiseFish Quality is fully compliant with HACCP specifications. End to end traceability is a click away in case of a recall.

Wisefish Processing

Seamlessly integrate inventory control, quality inspections, lot tracking, catch weight management, Electronic Data Interchange (EDI), and expiration date management with complete and detailed costing for full financial and regulatory control of your seafood processing operation.

WiseFish Peripherals

WiseFish Peripherals are applications that run outside of WiseFish and integrate with:

- Scales (Marel, Digi, Scanvaegt, Mettler Toledo, Rice Lake, etc.) through serial or TCP / IP ports
- Scanners (Symbol and Intermec) through USB, keyboard wedge, or serial port.
- Barcode printers – (Zebra, Intermec, Toshiba, etc.) Uses BarTender labelling software - the world's leading design and print software for labels, barcodes, and RFID tags.
- Dynamics NAV/WiseFish database (Connected to SQL Server through ODBC).

Box or Pallet level detail with optional barcode enabled identification. Track material movement within a warehouse, between warehouses, and beyond.

Wisefish Trade

Inventory Control, Broker Commissions and more for fast paced seafood sales operations. These tools are indispensable in meeting the rigorous buyer requirements of today's seafood market.

BI Tools

Affordable and user friendly BI and analytics reporting software and integrated data warehousing tools, including WiseAnalyzer are available as part of the WiseFish suite. Create customised reports, set targets, see results and easily understand the business implications of the data with easy to use SQL report builder tools.

AKVAconnect software

Role based control platform

AKVAconnect is a new process control platform used to connect to and keep control on everything from local farm sites to large international aquaculture corporations. The system is open ended and compatible with all types of equipment, sensors and technical installations. Smart 3D design with interactive control functions, makes it incredibly easy to operate.

Company

Region

Group

Device

A reliable software concept

AKVAconnect Site Control provides full overview and shows you the operating status of every component on your farm at all times. It also pin-points an alarm to the exact location of a problem should it occur.

The main overview provides fast access to the present state of the entire system.

The environmental software can easily supply individual data from each site.

AKVAconnect provides the ability to gather data and combine information from all levels of your aquaculture operations.

AKVAconnect is fully customizable, bringing forth exactly the information that the individual user needs.

The smart feeding control functions, well known in AKVA Control, are also avalible if needed.

akvasmart™

Get the full picture in seconds...

The AKVAconnect family

Site Control

Site suveillance provides detailed information and status reports from multiple sites in real-time and is a very useful tool when you centralize the operations.

AKVAconnect alarm system supports full traceability; "who, did what, and when" is not a question anymore.

Camera Control

Both analog and digital cameras are integrated in the system, and are fully controllable from any site or position.

Multible scalable camera windows can be shown and controlled directly on screen and monitored via internet using a Remote Video unit.

Feeding Control

AKVAconnect provides real time status of the entire farm, such as: live feeding status, silo levels, environmental- and pellet sensor readings.

All customications, such as language, settings and alarm preferences, are easily managed.

Environmental Control

Monitor and control all parameters in your production environment to secure maximum stability in your system. Temperature, oxygen, salinity, pH etc.

Process Control

All devices (are closely) can be monitored and controlled. Information about the present state, running hours and maintenance is conveniently monitored.

Control Menu

It is easy to navigate the different sites and systems through the intuitive menu.

Achieve full access to the process on the farm via internet using a PC, iPAD or a SmartPhone.

The new AKVAconnect family provides optimal process control.

akvasmart™

Service, support and training

Advanced aquaculture needs professional maintenance

As aquaculture equipment becomes more advanced, the need for professional service and preventive maintenance increases. AKVA group offers global professional service on all products.
Through on-site visits, AKVA group technician will get a complete overview and understanding of specific solutions on the site, specific requirements, preferences and work routines of local staff.

Sufficient training of your staff and managers will minimize the amount of frustration that builds up while browsing through a manual in search of a solution to a problem. Training of staff, face-to-face is always a smart investment.

AKVA group ASA may, in cooperation with Eksportfinans, offer competitive financing to foreign buyers. Eksportfinans, the Norwegian export credit agency for Export Financing, is owned by banks and the Norwegian Ministry for Trade and Industry.

Professional aquaculture training

Preparing, Training, Follow-up

All training programs are tailor-made and planned in close cooperation with the customer. Further on, and to ensure the highest possible learning outcome, the following stages are followed:

1. **Individual self-paced preparation phase**
2. **Face-to-face training**
3. **Close post-training follow-up**

The courses can take place in one of AKVA group's dedicated training facilities or, if preferred, at the customers site. The classes are instructed by AKVA group's dedicated specialists, ensuring the highest possible quality of the courses. Some of the most popular training modules include:

- **Product Specific Training, spanning the full AKVA group product range**
- **Advanced Product Maintenance**
- **Software Training**
- **Quality Farming programs (Level 1 & 2).**

Training is a key component of employee development, and is guaranteed to have a positive effect on staff motivation and operation. The invaluable relations and shared knowledge of the product specialists, ensures optimal utilization of all your AKVA technology.

The extensive curriculum includes numerous practical and theoretical product training courses, as well as a comprehensive 2 year Quality Farming program.

A range of useful courses

AKVA group's software courses are among the most popular. The coures can also easily be tailor made for each aquaculture farm.

The 2 year Quality Farming program ensures production optimization and improved results on the bottom line.

Well trained emploiees is a smart investment. It will improve the results and reduce the failures.

AKVA group offers a wide range of advanced aquaculture technology, and provides customized product training on demand.

Experienced and highly qualified AKVA group personel will teach the classes, both at the main courses and out on the customer´s locations.

Advanced aquaculture needs proffesional maintenance

As aquaculture equipment becomes more advanced, the need for professional service and preventive maintenance increases. AKVA group offers global professional service on all products; on or off location including:

- **Fixed pricing on reconditioned critical spare parts with guaranteed local availability.**
- **Technical telephone support during local office hours.**
- **Professional consultancy services.**
- **System upgrades, including fixed pricing on specific rebuild kits.**
- **Fast service response times.**

SmartService - a safe solution

Regular service prevents downtime, and thus ensures predictable and uninterrupted production. AKVA group's comprehensive and flexible Smart-Service agreement is a safe solution providing a wide range of benefits, such as:

- **Prioritized 24 hour telephone support.**
- **Discount on spare parts.**
- **Discount on service technician rates.**
- **Discount on software upgrades.**
- **Discount on AKVA training programs.**
- **Dedicated AKVA group service representative during office hours.**

It is recommended that the Smart-Service agreement is upgraded to include regular on-site visits by experienced technicians resulting in:

- **Status report of the site.**
- **Yearly maintenance documentation in accordance to local HSE standards.**
- **Development of regular preventive maintenance routines.**

Through on-site visits, AKVA group technician will get a complete overview and understanding of specific solutions on the site, specific requirements, preferences and work routines of local staff. Adding a face factor to this will ease communication between the site staff and the dedicated technician in the future.

Software Support - a necessary tool

Turning a software solution into the optimal work tool requires both understanding about local knowledge, work routines and preferences. Achieving optimal control on the farm often takes settings, tuning and adjustment of the software solution according to local requirements and priorities. For its turn-key customers, AKVA group's dedicated software team offers:

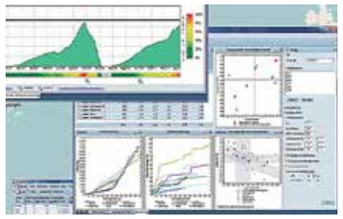
- **On-site support**
  Telephone support
  Online support
- **Implementation**
- **Training**
- **Upgrading of licenses**
- **Consulting**
- **Tailor-made solutions**
- **On-site training**
- **In depth training**
- **Securing long time investments**

Service is a smart ensurance

With a SmartService agreement, the farm manager can focus completely on the fish, while our technical staff looks after the equipment.

More advanced aquaculture technology increaces the need for more professional service, support and maintenance.

AKVA group offer a regular service visit with equipment control and maintenance, including detailed status reports.



Software support can include training, online support, consulting, implementation, server control & server security oe.

Financing - loan or leasing?

Financing through Export Credit Norway

In close cooperation with Export Credit Norway, AKVA group ASA can offer competitive financing arrangements for our customers in the export markets.

Export Credit Norway extends loans to large and small companies abroad for purchases from Norwegian exporters, offering favorable long-term financing. The company manages the whole lending process, including processing, documentation, disbursement and loan administration.

Export Credit Norway is a limited liability company wholly owned by the Norwegian government, and they finance export contracts ranging in value from a few million to several billion Norwegian kroner, across sectors and worldwide. The loans comply with the OECD framework on officially supported export credits.

AKVA group´s professional teams have decades of experience in planning and designing aquaculture projects.

Export Credit Norway offers competitively priced fixed and variable interest rates. Loan on Commercial Interest Reference Rate (CIRR) terms, may be given with a repayment period of between 2 and 18 years depending on the project type. Fish farming projects have so far qualified for a repayment period of 2-5 years, but a longer period might be achieved on a case-by-case basis.

CIRR is a free of charge interest rate option for the borrower in the period from acceptance of the loan until delivery of the equipment/service. Export Credit offers financing of up to 85% of the export contract.

The financing requires backing from the Norwegian Guarantee Institute for Export Credits and/or commercial bank(s) for 100% of the loan to cover political and commercial risks, related to the credit given in the whole repayment period.

Lending Process

All prospective borrowers that meet the requirements will receive a loan offer. For customers with low access to CAPEX this has proven to be a lucrative option to traditional financing.

Competitive financing from Export Credit Norway may benefit both AKVA group and customers as customers will be supported in their investments making transactions in the export markets possible at lower risk.

For more information, please visit;
www.eksportfinans.no

Competitive solutions

Flexible water treatment systems for salt- or fresh water, both outdoors and indoors installations, are often made possible through export finance.

Feed systems, monitoring equipment, net cleaners, and underwater lights can be leased.

New innovative projects, both land based and cage farming aquaculture have been financed world wide.

A wide range of cages, feed barges and work boats of different types and sizes have also been financed.

Cage Farming

Exciting, innovative solutions

AKVA group offers a wide range of cage farming aquaculture technology, from single components to complete installations worldwide.

We have developed a reputation for quality products and software that provide maximum reliability and cost effectiveness. Large numbers of cages, boats, net cleaners, feed barges, feed systems, sensors, cameras, underwater lights and software are currently in use on a wide variety of farms.

The equipment is operating year-round under diverse wave and wind conditions, in more than twelve regions of the world. This is a strong testemony of the reliability of the designs.

From single components to complete solutions

Plastic Cages
Feed Barges
Software
Steel Cages
Feed Systems
Work Boats
Environmental Sensors
Net Cleaning
Camera Systems
Underwater Lights
Nets

Feed Barges
AKVA group is the world´s leading supplier offeed barges with decades of experience and more than 250 barges delivered world wide.

Feed Systems
The central feed system was invented by AKVA group in 1980 and Akvasmart CCS is today the world´s most popular and reliable feed system.90

Cages
AKVA group is the leading supplier of both plastic and cages in aquaculture, and has since 1974 delivered more than 53,000 cages.

Software solutions
Fishtalk is a unique IT concept and tool that provides integrated operations and production control. The new AKVAconnect platform controls all the processes.

Camera and Sensor Systems
Advanced video camera and sensor systems monitor both the fish and the feeding process. This ensures optimum operations and a healthy environment.

Workboats
The robust Polarcirkel Workboat offers great design, quality build, unique flexibility, user-friendlyness and extra low maintenance.

Optimized feed care - every pellet counts...

AKVAcontrol

AKVAconnect

Fishtalk Control

CCS Feeding Computer

Feed Blower:

Generates transport air for the feed system.

Cleaning Plug Injector:

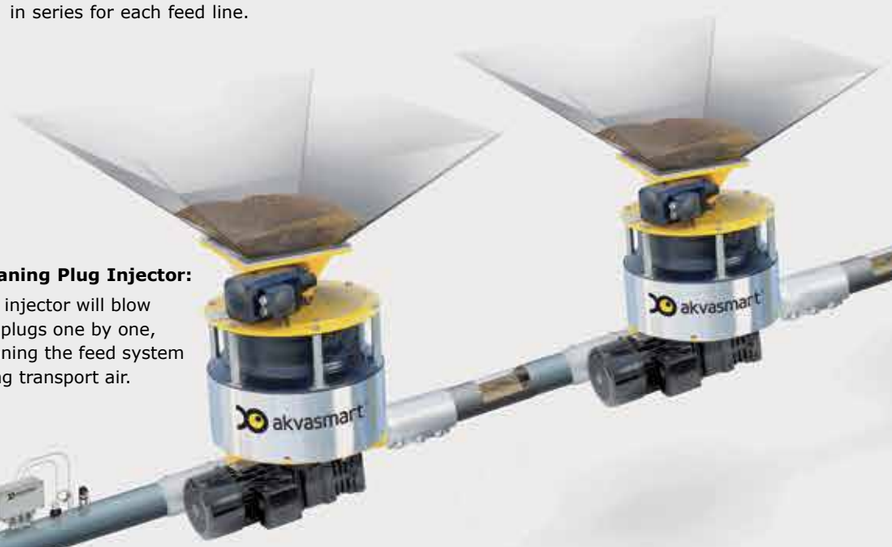
The injector will blow the plugs one by one, cleaning the feed system using transport air.

Air Cooler:

Reduces the temperature of the transport air.

Feed Silos:

Up to 8 silos can be connected in series for each feed line.



Air Control system:

Regulated air speed and keeping the pellet in the gentle feed handling area significantly reduce the risk of blockage and feed breakage.

Feed Dosers:

With capacities from 10g/sec up to 192kg/min. Up to 8 dosers can be connected in series for each feed line.

Environmental Sensors

Camera Systems

Network Systems

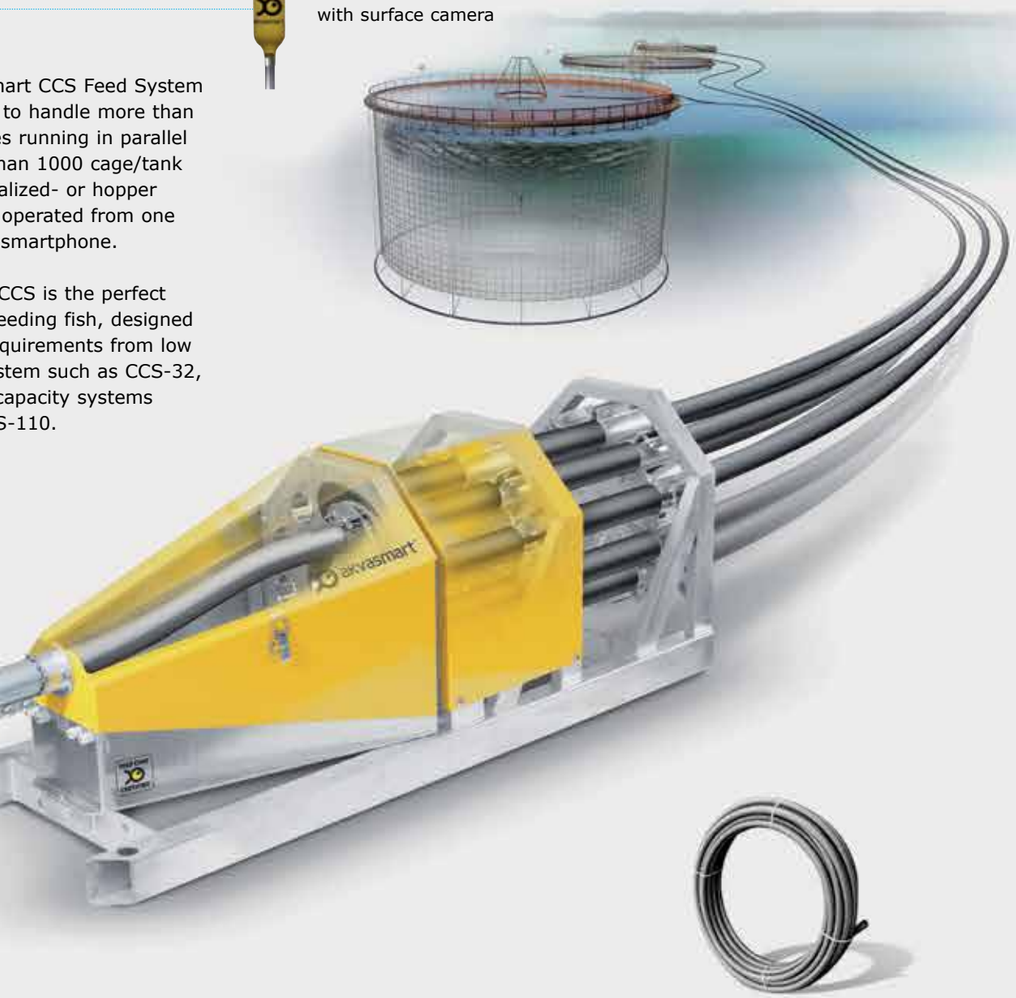
Underwater Lights

Rotor Spreaders

CAP Wireless Transmitter
with surface camera

The Akvasmart CCS Feed System is designed to handle more than 40 feed lines running in parallel and more than 1000 cage/tank units, centralized- or hopper feeders, all operated from one PC, iPad or smartphone.

Akvasmart CCS is the perfect choice for feeding fish, designed to fit the requirements from low capacity system such as CCS-32, up to high capacity systems such as CCS-110.



Feed Selector Valve:

Distributes feed to the correct cage and ensures gentle feed handling. The Selector Valves can be offered with connections from 4 to 60 feeding pipes.

Integrated accessories

A wide range of Akvasmart units as sensors, cameras, underwater lights and rotor spreaders can easily be integrated to the CCS Feed System.

Feed Pipes

A wide range of high quality and durable Polarcirkel Feed Pipes for aquaculture are available in various dimensions with wall thicknesses and coil lengths up to 1000 metres.

For more information, order our Cage Farming Aquaculture Catalogue. www.akvagroup.com

Dedicated aquaculture solutions

AKVA group offers tailor made solutions for a wide range of species both land based and cage farming aquaculture. Here´s some examples;

Acipencer sp.

N: Stør - GB: Sturgeon - ES: Esturión

Rachycentron canadum

N: Cobia - GB: Cobia - ES: Cobia

Oncorhynchus mykiss

N: Regnbueørret - GB: Rainbow Trout - ES: Trucha Arco Iris

Salmo salar

N: Laks - GB: Atlantic Salmon - ES: Salmón del Atlántico

Dicentrarchus labrax

N: Europeisk Havabbor - GB: European Sea Bass - ES: Lubina

Salvelinus alpinus

N: Røye - GB: Artic Char - ES: Trucha Alpina

Coregonus lavaretus

N: Sik - GB: Common Whitefish - ES: Lavareto

Sparus aurata

N: Dorade - GB: Sea Bream - ES: Dorada

Gadus morhua

N: Torsk - GB: Atlantic Cod - ES: Bacalao del Atlantico

Ctenopharyngodon idella

N: Gresskarpe - GB: Grass Carp - ES: Carpa China

Cyprinus sp.

N: Karpe - GB: Common Carp - ES: Carpa

Sander lucioperca

N: Gjørs - GB: Zander - ES: Lucioperca

Hippoglossus hippoglossus

N: Kveite - GB: Halibut - ES: Halibut

Psetta maxima

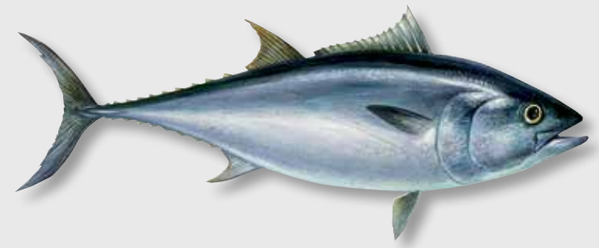
N: Piggvar - GB: Turbot - ES: Rodaballo

Solea solea

N: Sjøtunge - GB: Sole - ES: Lenguado

Pangasius sp.

N: Asiatisk Malle - GB: Striped Catfish - ES: Basa



Thunnus thynnus

N: Blåfinnet Tunfisk - GB: Bluefin Tuna - ES: Atún Aleta Azul

Oncorhynchus kisutch

N: Sølvlaks - GB: Coho - ES: Salmón Coho

Seriola sp.

N: Kingfish - GB: Amberjack/Kingfish - ES: Seriola sp.

Oncorhynchus tshawytscha

N: Kongelaks - GB: Chinook Salmon - ES: Salmón Rey

Haliotis sp.

N: Sjøøre - GB: Abalone - ES: Abulón

Oreochromis niloticus

N: Nilmunnruger - GB: Nile Tilapia - ES: Tilapia del Nilo

Lates calcarifer

N: Asiatisk Havabbor - GB: Barramundi - ES: Perca Gigante

Litopenaeus vannamei

N: Hvitfotreke - GB: Whiteleg Shrimp - ES: Camarón blanco

Labrus bergylta

N: Bergylte - GB: Ballan Wrasse - ES: Maragota

Ctenolabrus rupestris

N: Bergnebb - GB: Goldsinny Wrasse - ES: Tabernero

Penaeus monodon

N: Tigerreke - GB: Tiger Prawn - ES: Langostino Jumbo

Anarchicas minor

N: Flekksteinbit - GB: Catfish/Wolffish - ES: Perro del Norte

Holothuria sp.

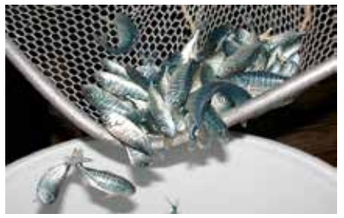
N: Sjøpølse - GB: Sea Cucumber - ES: Pepino del Mar

© Scandinavian Fishing Year Book

Aquaculture continues to be the fastest growing animal food-producing sector

State of the world aquaculture

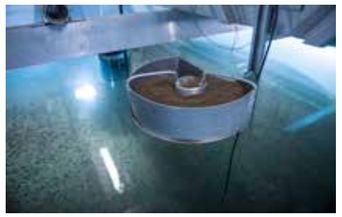
It all starts on land



New Zealand kingfish.

The expansion in world aquaculture depends highly on sufficient supply of fry for further ongrowing to market size. It all starts on land, and land based systems such as hatcheries, broodstock facilities and fry rearing systems are basic components for building up the sector.

Securing future fry production



Stable conditions - the key to success.

Future land based farming systems must secure high water qualities, optimal temperatures and oxygen levels to give optimal conditions for the fish reared. This will result in improved growth and survival rates to efficiently grow the numbers of healthy fry required. Stable conditions results in a steady and foreseeable growth pattern that makes it possible for the farmer to precisely predict when fish will have reached a certain stage or size.

Pre-ongrowing on land

Pre-ongrowing in land based systems is often a key to higher success. In salmon farming production of larger smolt is now taking up speed. More farmers recognize the befit of putting more effort into pre-ongrowing before fish are stocked into cages at sea. This improves growth performance and overall production results.

Regional aquaculture growth

Production within each region is diverse. World aquaculture is heavily dominated by the Asia–Pacific region, which accounts for 89 percent of production in terms of quantity and 77 percent in terms of value. This dominance is mainly due to China's enormous production, which accounts for 67 percent of global production in terms of quantity and 49 percent of global value. China produces 77 percent of all carps (cyprinids) and 82 percent of the global supply of oysters (ostreidae). The Asia–Pacific region accounts for 98 percent of carp, 95 percent of oyster production, and 88 percent of shrimps and prawns (penaeidae). Norway and Chile are the world's two leading producers of cultured salmons (salmonids), accounting for 33 and 31 percent, respectively, of world production.

Sturgeon farming.

80 million tons by 2050

According to FAO projections, it is estimated that in order to maintain the current level of per capita consumption, global aquaculture production will need to reach 80 million tons by 2050.

Aquaculture has the potential to make a significant contribution to this increasing demand for aquatic food in most regions of the world; however, in order to achieve this, the sector and the fish farmers will face great challenges.

(Source: FAO)

Aquaculture statistics

World aquaculture production of food fish* by continent (million tons).

	2010	2011	Share
Africa	1.3	1.4	2.2%
Americas	2.6	2.9	4.7%
Asia	52.4	55.5	88.5%
Europe	2.5	2.7	4.3%
Oceania	0.2	0.2	0.3%
Total	**59.0**	**62.7**	

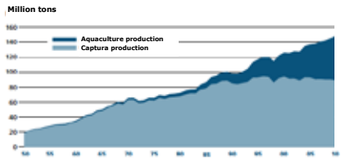
** Food fish = fishes, crustaceans, molluscs, amphibians (excluding crocodiles) and other aquatic animals (such as sea cucumber, sea urchin etc.) for human consumption.*

World top-20 aquaculture producers of food fish* (tons).

	2011
China	38 621 269
India	4 573 465
Vietnam	2 845 600
Indonesia	2 718 421
Bangladesh	1 523 759
Norway	1 138 797
Thailand	1 008 049
Egypt	986 820
Chile	954 845
Myanmar	816 820
Philippines	767 287
Brazil	629 309
Japan	556 761
Korea, RO	507 052
USA	396 841
Taiwan, POC	314 363
Ecuador	308 900
Malaysia	287 076
Spain	271 961
Iran	247 262
Total of top-20	**59 474 657**
Others	3 225 644
World Total	**62 700 300**

(Source: FAO)

World capture fisheries and aquaculture production



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